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Golder Associates

TRANSMITTAL LETTER

To: **Mary Logan**
USEPA (SR-6J)
77 West Jackson Blvd.
Chicago, IL 60604

Date: July 12, 2007

Project No.: 933-6154

Sent by:

[ ] Mail
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[X] Federal Express
[ ] Enclosed

Quantity	Item	Description
1	Copy	S/S/S Treatability Study Phase III Results, RUTGERS Organics Corporation, Nease Chemical Site, Salem, Ohio

Remarks:

cc: Luanne Vanderpool, 1 copy
Sheila Abraham, 1 copy
Tim Christman, 1 copy
Kevin Palombo. 1 copy

Per: Allen Kane/Steve Finn

"Mitchell, Stuart (Philly)" <stuart_mitchell@golder.com>

07/12/2007 07:05 AM

To

Subject Nease Chemical Site, Salem, Ohio - Revised Treatability Study Technical Memorandum; Golder Project No.: 933-6154

History: This message has been replied to.

Mary,

Please find attached for your review a copy of the Revised Stripping/Stabilization/Solidification Treatability Study Technical Memorandum. This revised Technical Memorandum incorporates comments received from the Agencies. Provided below is our responses to the Agencies comments.

If you should have any questions or require additional information, please do not hesitate to call me at 856-793-2005, ext. 34478.

Stuart

S/S/S Treatability Study Phase IV Proposal – Response to Agency Comments

<u>General overarching comments</u>

1. Extrapolation of the bench scale tests to field treatability studies: The air stripping bench scale tests were conducted for 135 minutes. However, Golder proposes to use a 90 minute period for the Phase IV verification testing. The recommendation seems to be based on extrapolation (apparent exponential decrease) of the 10, 30, 60 and 135 minutes VOC concentrations analytical data. However, the data seems to indicate additional good reduction in the 90 – 135 minute period. How will the time period used during the Phase IV studies be used to support recommendations for full scale implementation? Are there specific parameters that we should be evaluating for field implementation?

   Response:
   There was additional volatile removal from 90 to 135 minutes; however, the performance goal for remediation is the reduction in leachability based on the combined effect of both air stripping and stabilization. By 90 minutes, air stripping had achieved over 80 percent removal in both samples and the removal rate was declining. Based on the Agencies' comment, we plan to run two parallel tests during Phase IV. One sample will be stripped for 90 minutes and one sample will be stripped for 135 minutes. ok

2. Note also the variability in the time continuum % decrease in VOC concentrations between the samples destined for the cement-flyash treatment (sample # SE0190-015) and cement lime kiln (sample # SE0190-016). Although the overall VOC % decrease in both samples at 135 minutes is around 85%, SE0190-015 has an initially greater % decrease (51.3% at 10 minutes; 59.4% at 30 minutes) versus SE0190-016 (17.8% at 10 minutes; 39.6% at 30 minutes). At the 60 minutes the % removals are reversed, with SE0190-016 showing a marginally greater % removal (63%, versus 60%). Also, in SE0190-015, there is an increase in 1,2-dichlorobenzene between the 30 minutes and 60 minutes, although it then decreases at 135 minutes. This may be within the limits of sample

variability, but if not, when does the trend reverse? Given the somewhat differing VOC removal trends in samples with the same initial VOC levels and handled in the same manner, it would be helpful to have data between 60 and 135 minutes to support the extrapolation of the 90 minute proposed air stripping period.

Response:
These differing rates of removal over time are likely due to the heterogeneous nature of the material and within the limits of sample variability. As noted above, parallel samples will be run during Phase IV using both 90 and 135 minute periods. OK

3. Since 1,2-dichlorobenzene appears to be the least well stabilized in the bench tests, what issues does Golder anticipate during the field implementation, particularly given the issues with dechlorination in the NZVI pilot?

Response:
For the air stripped samples, the tests achieved 98-99% removal in 1,2-dichlorobenzene in the total VOC analysis and 94-95% reduction in the SPLP VOC analysis. While 1,2 dichlorobenzene may be the most difficult contaminant to treat, these tests indicate that field performance can meet the ROD goals.

4. Lime kiln versus fly ash: Although lime kiln and fly ash 21 day cures achieve very similar results in terms of % removal, in absolute VOC concentration and SPLP analyses terms, the lime kiln dust achieves lower VOC concentrations. While acknowledging sampling variability and all the uncertainties associated with extrapolating these results to field, is the cost-benefit of using fly ash a substantive difference, enough to justify its use over lime kiln? Does Golder have any data on the field performance of one over the other?

Response:
Our initial evaluation of reagent costs shows that fly ash is significantly less expensive than lime kiln dust ($25/ton vs. $41). Both have been used successfully to stabilize organic and inorganic constituents in soil. For the full scale implementation, we intend to give the contractor some flexibility regarding the reagent and percent mixture if they can demonstrate that they can meet remediation performance criteria to be agreed with the Agencies. OK

<u>Suggestions/ clarifications for the final S/S/S Technical Memo</u>

The following suggestions may be useful in drafting the S/S/S Treatability Study Technical Memo, when finally submitted.

5. Please include the results of all study phases in the complete/ final technical memo.

Response:
At the conclusion of the S/S/S treatability study, a complete report on the results of the various phase of the treatability study will be included with the final technical memorandum that will be submitted. OK

6. Decreased concentrations in control sample: Please discuss the substantive differences between VOC concentrations in Untreated Material A, B and C and that in the "control" sample. Was the control sample collected and handled before analysis in the same way as Untreated Material A, B and C? The control samples also had an approximate loss in VOC concentration of approximately 25%

(11% to 44% depending on the constituent) at the end of the 21 day period- what was this due to? How were the control samples maintained? Are there any lessons learnt that can be factored into remedial design?

Response:
Differences were noted in the total VOC concentrations between the initial untreated material and the control samples. These differences are likely related to the heterogeneous nature of the material (samples cannot be completely homogenized without unacceptable loss of volatiles). To reduce the effect of differences related to sample heterogeneity, the parent material proposed for Phase IV testing will be tested for total VOCs on a fast turn around basis to verify that a representative sample of the site material is being tested. ok

7. *Table 1: The results presented for the Untreated Material* (A, B, *and* C) *differ from that provided* for the samples collected in Pond 2 in Phase 1. Were additional samples collected to characterize the untreated material?

Response:
No additional samples were collected. The differences between the samples are most likely due to the naturally heterogeneous nature of the material. ok

8. Why are the Air Stripping (AS) Parent Mixture VOC concentrations higher (across all constituents) than the ZVI Parent Mixture? Were the parent mixtures handled differently at the beginning of the study? It is also interesting that VOCs such as ethyl benzene and carbon tetrachloride show up in the AS and ZVI Parent Mixtures and not in the Untreated Material characterization, even though the levels of other VOCs shown as detected are not that different.

Response:
The differences between the samples are most likely related to the naturally heterogeneous nature of the material. ok

9. Table 2 and Table 3: Several VOCs (for example, carbon tetrachloride, ethyl benzene, o-xylene) are not included as a parameter, even when detected in the AS Parent Mixture (per Table 1 and Table 4). All detected VOCs should be included, to arrive at a more accurate removal %.

Response:
Tables 2 & 3 have been revised to include all VOCs. There were no material differences in the calculated percent removal rates. ok

10. Figure 1: Do the tables refer to those within another workplan? (They are not provided here). If they are not relevant to this study, add that to the footnote.

Response:
The tables noted on Figure 1 refer to draft tables provided by the treatability laboratory; these tables will be included in the final report. Notes identifying them as draft tables have been added to the figure. ok

Table 1a.pdf Figure 1.pdf Figure 2.pdf Figure 3.pdf Figure 4.pdf Figure 5.pdf Rev S_S_S Phase III Memorandum.pdf

Rev Table 2.pdf Rev Table 3.pdf Rev Table 4 & 4a.pdf Table 1.pdf

TECHNICAL MEMORANDUM

TO:	Mary Logan, USEPA	**DATE:**	July 12, 2007
FR:	Joe Gormley, Randy White, Steve Finn	**OUR REF:**	933-6154
RE:	**STRIPPING/STABILIZATION/SOLIDIFICATION (S/S/S) TREATABILITY STUDY PHASE III RESULTS, NEASE CHEMICAL SITE, SALEM, OHIO (REVISED)**		

The purpose of this memorandum is to provide a status update of the Stripping/ Stabilization/Solidification (S/S/S) Treatability Study, including the Phase III results, and to propose the treatment method and reagent formulation for USEPA/Ohio EPA approval before proceeding with the final phase (IV) of the Study.

1.0 SCOPE/OBJECTIVES

The scope of the Treatability Study is described in the Pre-Design Investigation Work Plan (PDI Work Plan; Golder Associates, September 2006). The overall objective of the S/S/S technology is to reduce the chemical leachability of the treated volume to mitigate future releases of chemicals to groundwater from former Ponds 1 and 2. The primary objective of the S/S/S Treatability Study is to determine the most appropriate methods and admixtures for full-scale operation that will result in adequate strength (to support the construction of a geosynthetic cap) and substantial reduction of chemical leachability.

The treatability testing is being conducted in four phases:

- Phase I – Field Sampling and Baseline Characterization;
- Phase II – Screening Tests;
- Phase III – Intermediate Tests; and
- Phase IV – Verification Tests.

During Phase I, Golder Associates identified an area in former Pond 2 that exhibited elevated chemical impacts and, with USEPA/Ohio EPA approval, collected samples from this location for use in the S/S/S treatability study. After receiving the samples, the laboratory homogenized the material to create a "parent mixture" while seeking to minimize loss of volatiles and performed baseline physical, chemical, and leachability (SPLP) testing to define the characteristics of the untreated material and to confirm that it represented the material observed in the field.

In Phase II, the parent mixture was treated with 10 different stabilization/ solidification (S/S) admixture formulations to determine the strength properties of the mixtures. Based on these test results, and with the approval of the USEPA/Ohio EPA, the following two admixtures were selected for further evaluation:

- 7.5% Portland Cement / 15% Class "C" Flyash; and
- 7.5% Portland Cement / 15% Lime Kiln Dust.

2.0 PHASE III TESTING

Phase III - Intermediate Testing was designed to determine the benefits of in-situ air stripping of the soils prior to solidification/stabilization (S/S), as well as the potential benefits of zero-valent iron (ZVI) amendments to the formulations selected in Phase II. As defined in the PDI Work Plan, the primary goals of Phase III were the following:

- to compare the treatment benefits of air stripping versus ZVI addition;
- to evaluate total constituent and SPLP concentration reduction achieved by the selected S/S formulations; and
- to ultimately select the final treatment approach for verification testing in Phase IV.

The steps of Phase III testing are shown in Figure 1 and described below.

2.1 Air Stripping Evaluation

A portion of the initial parent mixture was selected for the air stripping evaluation and submitted for total constituent and SPLP analysis of TCL VOCs. The results for these analyses were comparable to the results for the initial analyses of the parent material (see Tables 1 and 1a).

Two aliquots (SE0190-015 and SE0190-016) were then subjected to a bench-scale simulation of in-situ air stripping. To simulate air stripping, the soils were mixed using a Hobart mixer in a sealed glove box and maintained at approximately 55°F. Flow rate, temperature, and humidity of the influent and effluent air were continuously recorded. VOCs emitted during the mixing were carried by the sweep gas out of the glove box to an absorbent carbon cartridge. A sampling tee upstream from the carbon was used to continuously monitor total VOC concentrations of the sweep gas with a PID. Figures 2 and 3 show the PID concentrations over time for the two aliquots. Excel® was used to apply trendlines to the data shown on the figures. The sudden drops in PID readings are associated with sampling episodes as described below.

Samples from the treated soils were collected at elapsed times of approximately 10, 30, and 60 minutes after the start of mixing/air stripping and analyzed for total constituent concentrations of TCL VOCs. The soil sample analyses results are summarized in Tables 2 and 3 and Figures 2 and 3 show the soil concentrations in relation to the PID readings. Applying trendlines with best fit to these figures shows that the soil concentration (as well as PID results) appear to be decreasing exponentially. Figures 4 and 5 plot the decrease in soil concentration along with the percent removal. From these figures it can be seen that greater than 80 percent of total VOCs were removed from the material in approximately 90 minutes.

2.2 ZVI Evaluation

A portion of the initial parent mixture was selected for the ZVI evaluation and analyzed for TCL VOCs on a total constituent concentration basis, as well as in SPLP extracts. The results were comparable to those for the initial analysis of the parent material (see Tables 1 and 1a). Two aliquots of the ZVI parent mixture (SE0190-017 and SE0190-018) were then treated with the addition of granular (40 µm-1,200 µm) ZVI. The ZVI was added to the samples in amounts corresponding to approximately five times the stoichiometric amount estimated for treatment of all VOCs and SVOCs (as determined in "parent" baseline sampling).

2.3 Control Samples

A control sample was taken from the parent material at the beginning of Phase III testing (Untreated Control - Day 0). The total VOC and SPLP results for this control sample are shown in Tables 1 and 1a and indicate lower levels of contaminants then any of the treatment samples. The untreated control sample was then placed in a zip lock bag and stored at room temperature for 21 days. After 21 days a sample was collected (Untreated Control - Day 21) and submitted for total constituent and SPLP analysis of TCL VOCs (refer to Tables 1 and 1a). The untreated control sample results for the 21 day sample show significant decreases in total VOCs and a lesser decrease in SPLP VOCs over the same time period. These changes may be related to volatilization, heterogeneity of the material, or sampling procedures.

2.4 Formulation Evaluation

Following air stripping and ZVI addition, the stripped samples (SE0190-015 and SE0190-016) and the two ZVI treated samples (SE0190-017 and SE0190-018) were mixed with the selected stabilization agents (7.5% Portland Cement/15% Class C Fly Ash and 7.5% Portland Cement/15% Lime Kiln dust) and allowed to cure for 21 days. After 21 days, the samples were analyzed for concentrations of TCL VOCs on a total constituent concentration basis and in the SPLP extract. The results for these analyses along with percent removals are summarized on Tables 4 and 4a.

3.0 CONCLUSIONS/NEXT STEPS

3.1 Conclusions

The results of Phase III testing demonstrate the following:

- The optimum duration for air stripping was 90 minutes.
- Both the air stripping and ZVI treatment trains provided significant percent reductions in total VOCs; however, the air stripping treatment train provided significantly greater percent reductions in leachability compared to the ZVI treatment;
- The Cement/Class C Fly Ash and the Cement/Lime Kiln Dust formulations provided similar percent reductions in total VOCs and leachable VOCs; and
- Air stripping along with either the Cement/Fly Ash or the Cement/Lime Kiln Dust formulation appears to provide the best treatment and stabilization formulation for meeting the goal of mitigating future release of chemicals to groundwater from former Ponds 1 and 2.
- Prior to the next phase, the parent material proposed for Phase IV testing should be tested for total VOC analysis on a fast turn-around basis to verify that a representative sample of the site material is being treated.

3.2 Next Steps

Subject to USEPA/Ohio EPA approval, Golder Associates proposes to perform Phase IV verification testing on two samples in the following manner:

- Perform rapid-turn-around TCL VOC analysis of both samples to verify that the testing will be performed on representative material;
- Perform total TCL semi-VOC, SPLP TCL VOCs, and SPLP TCL semi-VOC analyses to define the baseline condition;
- Perform air stripping on one sample for 90 minutes and on the other sample for 135 minutes;
- Stabilize both samples with 7.5% Portland Cement and 15% Class C Fly Ash*;
- Allow both samples to cure for 21 days;
- Perform Total and SPLP VOC and SVOC analyses on both samples; and
- Perform strength testing on both samples.

* Note: Fly ash is significantly less expensive than lime kiln dust ($25 per ton versus $41 per ton for 35, 000 tons) and appears to afford the same level of treatment.

Table 1
S/S/S Treatability Study
Phase III Testing Results - Comparison of Control Sample and Parent Mixture Testing Results
Summary of Total Volatiles Analyses - EPA Method 8260B
Nease Chemical Site
Salem, Ohio

Results (µg/Kg)	Untreated Material Characterization			Control Testing		Air Stripping and ZVI Testing	
Total Volatiles Analysis	Untreated - A Result	Untreated - B Result	Untreated - C Result	Untreated Control - Day 0 Result	Untreated Control - Day 21 Result	AS Parent Mixture Result	ZVI Parent Mixture Result
Acetone	-	-	-	-	-	-	-
Benzene	51,400	43,900	48,500	3,600	961	46,200	31,500
Bromobenzene	-	-	-	-	-	-	-
Bromochloromethane	-	-	-	-	-	-	-
Bromodichloromethane	-	-	-	-	-	-	-
Bromoform	-	-	-	-	-	-	-
Bromomethane	-	-	-	-	-	-	-
2-Butanone	-	-	-	-	-	-	-
n-Butylbenzene	-	-	-	-	-	-	-
sec-Butylbenzene	-	-	-	-	-	-	-
tert-Butylbenzene	-	-	-	-	-	-	-
Carbon disulfide	-	-	-	-	-	-	-
Carbon tetrachloride	-	-	-	-	-	6,640	4,370
Chlorobenzene	30,300	29,000	29,500	3,910	-	31,200	20,400
Chlorodibromomethane	-	-	-	-	-	-	-
Chloroethane	-	-	-	-	-	-	-
2-Chloroethyl vinyl ether	-	-	-	-	-	-	-
Chloroform	-	-	-	-	-	-	-
Chloromethane	-	-	-	-	-	-	-
2-Chlorotoluene	-	-	-	-	-	-	-
4-Chlorotoluene	-	-	-	-	-	-	-
,2-Dibromo-3-chloropropane	-	-	-	-	-	-	-
1,2-Dibromoethane	-	-	-	-	-	-	-
Dibromomethane	-	-	-	-	-	-	-
1,2-Dichlorobenzene	3,880,000	3,410,000	3,330,000	892,000	231,000	3,840,000	2,690,000
1,3-Dichlorobenzene	-	-	-	-	-	-	-
1,4-Dichlorobenzene	29,600	27,500	26,500	6,840	1,580	30,100	19,500
Dichlorodifluoromethane	-	-	-	-	-	-	-
1,1-Dichloroethane	-	-	-	-	-	-	-
1,2-Dichloroethane	-	-	-	-	-	-	-
1,1-Dichloroethene	-	-	-	-	-	-	-
cis-1,2-Dichloroethene	-	-	-	-	-	-	-
trans-1,2-Dichloroethene	-	-	-	-	-	-	-
1,2-Dichloropropane	-	-	-	-	-	-	-
1,3-Dichloropropane	-	-	-	-	-	-	-
2,2-Dichloropropane	-	-	-	-	-	-	-
cis-1,3-Dichloropropene	-	-	-	-	-	-	-
trans-1,3-Dichloropropene	-	-	-	-	-	-	-
1,1-Dichloropropene	-	-	-	-	-	-	-
Ethylbenzene	-	-	-	-	-	10,100	6,250
2-Hexanone	-	-	-	-	-	-	-
Hexachlorobutadiene	-	-	18,600	6,430	1,250	11,900	7,940
Isopropylbenzene	-	-	-	3,650	-	15,000	9,310
p-Isopropyltoluene	-	-	-	-	-	-	-
4-Methyl-2-pentanone	-	-	-	-	-	-	-
Methylene chloride	-	-	-	-	-	-	-
Naphthalene	-	-	-	-	-	132,000	5,520
n-Propylbenzene	-	-	-	-	-	-	-
Styrene	-	-	-	-	-	-	-
1,1,1,2-Tetrachloroethane	-	-	-	-	-	-	-
1,1,2,2-Tetrachloroethane	241,000	202,000	192,000	22,600	10,100	197,000	126,000
Tetrachloroethene	966,000	874,000	888,000	161,000	18,700	977,000	648,000
Toluene	35,900	31,400	33,400	3,710	-	36,400	23,700
1,2,3-Trichlorobenzene	-	-	-	-	-	-	-
1,2,4-Trichlorobenzene	-	-	-	-	-	-	-
1,1,1-Trichloroethane	-	-	-	-	-	-	-
1,1,2-Trichloroethane	-	-	-	-	-	-	-
Trichloroethene	73,600	59,900	63,600	7,670	1,870	69,800	49,600
Trichlorofluoromethane	-	-	-	-	-	-	-
1,2,3-Trichloropropane	-	-	-	-	-	-	-
1,2,4-Trimethylbenzene	-	-	-	-	-	-	-
1,3,5-Trimethylbenzene	-	-	-	-	-	-	-
Vinyl acetate	-	-	-	-	-	-	-
Vinyl chloride	-	-	-	-	-	-	-
o-Xylene	-	-	-	-	-	7,990	4,750
m, p -Xylene	30,200	26,300	29,700	5,900	-	39,000	24,500
Totals	5,338,000	4,704,000	4,659,800	1,117,310	265,461	5,450,330	3,671,340

Table 1a
S/S/S Treatability Study
Phase III Testing Results - Comparison of Control Sample and Parent Mixture Testing Results
Summary of SPLP Analyses - EPA Method 1312/8260B
Nease Chemical Site
Salem, Ohio

Results (µg/L)	Untreated Material Characterization			Control Testing		Air Stripping and ZVI Testing	
Total Volatiles Analysis	Untreated - A Result	Untreated - B Result	Untreated - C Result	Untreated Control - Day 0 Result	Untreated Control - Day 21 Result	AS Parent Mixture Result	ZVI Parent Mixture Result
Acetone	-	-	-	-	-	-	-
Benzene	3,220	2,400	2,350	492	309	1,410	1,770
Bromobenzene	-	-	-	-	-	-	-
Bromochloromethane	-	-	-	-	-	-	-
Bromodichloromethane	-	-	-	-	-	-	-
Bromoform	-	-	-	-	-	-	-
Bromomethane	-	-	-	-	-	-	-
2-Butanone	-	-	-	-	-	-	-
n-Butylbenzene	-	-	-	-	-	-	-
sec-Butylbenzene	-	-	-	-	-	-	-
tert-Butylbenzene	-	-	-	-	-	-	-
Carbon disulfide	-	-	-	-	-	-	-
Carbon tetrachloride	-	-	-	-	-	-	-
Chlorobenzene	1,380	1,280	1,250	474	380	890	1,090
Chlorodibromomethane	-	-	-	-	-	-	-
Chloroethane	-	-	-	-	-	-	-
2-Chloroethyl vinyl ether	-	-	-	-	-	-	-
Chloroform	67.4	-	-	-	-	-	-
Chloromethane	-	-	-	-	-	-	-
2-Chlorotoluene	-	-	-	-	-	-	-
4-Chlorotoluene	-	-	-	-	-	-	-
,2-Dibromo-3-chloropropane	-	-	-	-	-	-	-
1,2-Dibromoethane	-	-	-	-	-	-	-
Dibromomethane	-	-	-	-	-	-	-
1,2-Dichlorobenzene	80,800	92,300	92,300	56,300	54,000	67,800	69,400
1,3-Dichlorobenzene	-	-	-	-	-	-	-
1,4-Dichlorobenzene	567	659	604	412	411	522	530
Dichlorodifluoromethane	-	-	-	-	-	-	-
1,1-Dichloroethane	-	-	-	-	-	-	-
1,2-Dichloroethane	482	304	286	-	-	166	208
1,1-Dichloroethene	-	-	-	-	-	-	-
cis-1,2-Dichloroethene	-	-	-	-	-	-	-
trans-1,2-Dichloroethene	-	-	-	-	-	-	-
1,2-Dichloropropane	-	-	-	-	-	-	-
1,3-Dichloropropane	-	-	-	-	-	-	-
2,2-Dichloropropane	-	-	-	-	-	-	-
cis-1,3-Dichloropropene	-	-	-	-	-	-	-
trans-1,3-Dichloropropene	-	-	-	-	-	-	-
1,1-Dichloropropene	-	-	-	-	-	-	-
Ethylbenzene	265	273	268	129	-	190	242
2-Hexanone	-	-	-	-	-	-	-
Hexachlorobutadiene	-	-	-	-	-	-	-
Isopropylbenzene	388	397	395	135	152	148	138
p-Isopropyltoluene	-	-	-	-	-	-	-
4-Methyl-2-pentanone	-	-	-	-	-	-	-
Methylene chloride	-	-	-	-	-	-	-
Naphthalene	-	-	-	-	-	-	-
n-Propylbenzene	-	-	-	-	-	-	-
Styrene	-	-	-	-	-	-	-
1,1,1,2-Tetrachloroethane	-	-	-	-	-	-	-
1,1,2,2-Tetrachloroethane	13,000	10,300	10,600	2,540	2,140	6,250	9,010
Tetrachloroethene	27,000	30,600	29,000	15,300	11,900	23,200	24,000
Toluene	1,760	1,570	1,560	474	395	1,020	1,280
1,2,3-Trichlorobenzene	-	-	-	-	-	-	-
1,2,4-Trichlorobenzene	-	-	-	-	-	-	-
1,1,1-Trichloroethane	-	-	-	-	-	-	-
1,1,2-Trichloroethane	-	-	-	-	-	-	-
Trichloroethene	3,610	3,120	3,020	826	721	2,130	2,600
Trichlorofluoromethane	-	-	-	-	-	-	-
1,2,3-Trichloropropane	-	-	-	-	-	-	-
1,2,4-Trimethylbenzene	-	-	-	-	-	-	-
1,3,5-Trimethylbenzene	-	-	-	-	-	-	-
Vinyl acetate	-	-	-	-	-	-	-
Vinyl chloride	-	-	-	-	-	-	-
o-Xylene	161	162	137	-	-	144	161
m, p -Xylene	924	970	955	522	460	783	842

TABLE 2 (Revised)
S/S/S Treatability Study
SOIL SE0190-015: Untreated
AIR STRIPPING: SAMPLING @ 10, 30, 60, 135 MINUTES
Summary of Total Volatiles Analyses - EPA Method 8260B
(Destined for 7.5% Portland Cement, 15% Fly Ash Treatment)
Nease Chemical Site
Salem, Ohio

Parameter	AS Parent Mixture (µg/Kg)		AS @ 10 minutes (µg/Kg)		AS @ 30 minutes (µg/Kg)		AS @ 60 minutes (µg/Kg)		AS @ 135 minutes (µg/Kg)	
	0		10		30		60		135	
	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL
Acetone	-	50,000	-	50,000	-	50,000	-	50,000	-	34,400
Benzene	46,200	5,000	8,830	5,000	-	5,000	-	5,000	5,650	3,440
Bromobenzene	-	5,000	-	5,000	-	5,000	-	5,000	-	3,440
Bromochloromethane	-	5,000	-	5,000	-	5,000	-	5,000	-	3,440
Bromodichloromethane	-	5,000	-	5,000	-	5,000	-	5,000	-	3,440
Bromoform	-	5,000	-	5,000	-	5,000	-	5,000	-	3,440
Bromomethane	-	10,000	-	10,000	-	10,000	-	10,000	-	6,890
2-Butanone	-	25,000	-	25,000	-	25,000	-	25,000	-	17,200
n-Butylbenzene	-	5,000	-	5,000	-	5,000	-	5,000	-	3,440
sec-Butylbenzene	-	5,000	-	5,000	-	5,000	-	5,000	-	3,440
tert-Butylbenzene	-	5,000	-	5,000	-	5,000	-	5,000	-	3,440
Carbon disulfide	-	5,000	-	5,000	-	5,000	-	5,000	-	3,440
Carbon tetrachloride	6,640	5,000	-	5,000	-	5,000	-	5,000	-	3,440
Chlorobenzene	31,200	5,000	12,100	5,000	9,010	5,000	-	5,000	-	3,440
Chlorodibromomethane	-	5,000	-	5,000	-	5,000	-	5,000	-	3,440
Chloroethane	-	10,000	-	10,000	-	10,000	-	10,000	-	6,890
2-Chloroethyl vinyl ether	-	20,000	-	20,000	-	20,000	-	20,000	-	13,800
Chloroform	-	5,000	-	5,000	-	5,000	-	5,000	-	3,440
Chloromethane	-	20,000	-	20,000	-	20,000	-	20,000	-	13,800
2-Chlorotoluene	-	5,000	-	5,000	-	5,000	-	5,000	-	3,440
4-Chlorotoluene	-	5,000	-	5,000	-	5,000	-	5,000	-	3,440
1,2-Dibromo-3-chloropropane	-	20,000	-	20,000	-	20,000	-	20,000	-	13,800
1,2-Dibromoethane	-	5,000	-	5,000	-	5,000	-	5,000	-	3,440
Dibromomethane	-	5,000	-	5,000	-	5,000	-	5,000	-	3,440
1,2-Dichlorobenzene	3,840,000	12,500	1,970,000	5,000	1,680,000	25,000	1,860,000	5,000	690,000	3,440
1,3-Dichlorobenzene	-	5,000	-	5,000	-	5,000	-	5,000	-	3,440
1,4-Dichlorobenzene	30,100	5,000	15,800	5,000	15,800	5,000	13,400	5,000	5,090	3,440
Dichlorodifluoromethane	-	10,000	-	10,000	-	10,000	-	10,000	-	6,890
1,1-Dichloroethane	-	10,000	-	10,000	-	10,000	-	10,000	-	6,890
1,2-Dichloroethane	-	5,000	-	5,000	-	5,000	-	5,000	-	3,440
1,1-Dichloroethene	-	5,000	-	5,000	-	5,000	-	5,000	-	3,440
cis-1,2-Dichloroethene	-	5,000	-	5,000	-	5,000	-	5,000	-	3,440
trans-1,2-Dichloroethene	-	5,000	-	5,000	-	5,000	-	5,000	-	3,440
1,2-Dichloropropane	-	5,000	-	5,000	-	5,000	-	5,000	-	3,440
1,3-Dichloropropane	-	5,000	-	5,000	-	5,000	-	5,000	-	3,440
2,2-Dichloropropane	-	5,000	-	5,000	-	5,000	-	5,000	-	3,440
cis-1,3-Dichloropropene	-	5,000	-	5,000	-	5,000	-	5,000	-	3,440
trans-1,3-Dichloropropene	-	5,000	-	5,000	-	5,000	-	5,000	-	3,440
1,1-Dichloropropene	-	5,000	-	5,000	-	5,000	-	5,000	-	3,440
Ethylbenzene	10,100	5,000	-	5,000	-	5,000	-	5,000	-	3,440
2-Hexanone	-	2,500	-	25,000	-	25,000	-	25,000	-	17,200
Hexachlorobutadiene	11,900	5,000	8,850	5,000	9,200	5,000	10,100	5,000	5,930	3,440
Isopropylbenzene	15,000	5,000	8,120	5,000	7,190	5,000	5,890	5,000	-	3,440
p-Isopropyltoluene	-	5,000	-	5,000	-	5,000	-	5,000	-	3,440
4-Methyl-2-pentanone	-	2,500	-	25,000	-	25,000	-	25,000	-	17,200
Methylene chloride	-	10,000	-	10,000	-	10,000	-	10,000	-	6,890
Naphthalene	132,000	5,000	-	5,000	-	5,000	-	5,000	-	3,440
n-Propylbenzene	-	5,000	-	5,000	-	5,000	-	5,000	-	3,440
Styrene	-	5,000	-	5,000	-	5,000	-	5,000	-	3,440
1,1,1,2-Tetrachloroethane	-	5,000	-	5,000	-	5,000	-	5,000	-	3,440
1,1,2,2-Tetrachloroethane	197,000	5,000	73,900	5,000	71,400	5,000	47,200	5,000	35,000	3,440
Tetrachloroethene	977,000	5,000	427,000	5,000	324,000	5,000	181,000	5,000	85,000	3,440
Toluene	36,400	5,000	11,800	5,000	7,390	5,000	-	5,000	-	3,440
1,2,3-Trichlorobenzene	-	5,000	-	5,000	-	5,000	-	5,000	-	3,440
1,2,4-Trichlorobenzene	-	5,000	-	5,000	-	5,000	-	5,000	-	3,440
1,1,1-Trichloroethane	-	5,000	-	5,000	-	5,000	-	5,000	-	3,440
1,1,2-Trichloroethane	-	5,000	-	5,000	-	5,000	-	5,000	-	3,440
Trichloroethene	69,800	5,000	24,100	5,000	9,890	10,000	6,580	5,000	10,700	3,440
Trichlorofluoromethane	-	10,000	-	10,000	-	10,000	-	10,000	-	6,890
1,2,3-Trichloropropane	-	5,000	-	10,000	-	5,000	-	10,000	-	6,890
1,2,4-Trimethylbenzene	-	5,000	-	5,000	-	5,000	-	5,000	-	3,440
1,3,5-Trimethylbenzene	-	5,000	-	5,000	-	5,000	-	5,000	-	3,440
Vinyl acetate	-	10,000	-	10,000	-	10,000	-	10,000	-	6,890
Vinyl chloride	-	10,000	-	10,000	-	10,000	-	10,000	-	6,890
o-Xylene	7,990	5,000	-	5,000	-	5,000	-	5,000	-	3,440
m, p -Xylene	39,000	5,000	15,700	5,000	12,300	5,000	6,730	5,000	-	3,440
	(µg/Kg)		(µg/Kg)	Percent Removal	(µg/Kg)	Percent Removal	(µg/Kg)	Percent Removal	(µg/Kg)	Percent Removal
Total VOCs	5,450,330		2,576,200		2,146,180		2,130,900		837,370	
Total Percent Removal				52.7%		60.6%		60.9%		84.6%
Rate of Removal Over Time (% Removal/Minute)				5%		2%		1%		1%

Note: From Draft Kemron Table 9

TABLE 3 (Revised)
S/S/S Treatability Study
SOIL SE0190-016: Untreated
AIR STRIPPING: SAMPLING @ 10, 30, 60, 135 MINUTES
Summary of Total Volatiles Analyses - EPA Method 8260B
(Destined for 7.5% Portland Cement, 15% Lime Kiln Dust Teatment)
Nease Chemical Site
Salem, Ohio

	AS Parent Mixture (µg/Kg)		AS @ 10 minutes (µg/Kg)		AS @ 30 minutes (µg/Kg)		AS @ 60 minutes (µg/Kg)		AS @ 135 minutes (µg/Kg)	
	0		10		30		60		135	
	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL
Acetone	-	50,000	-	50,000	-	50,000	-	50,000	-	21,400
Benzene	46,200	5,000	13,600	5,000	-	5,000	-	5,000	-	2,140
Bromobenzene	-	5,000	-	5,000	-	5,000	-	5,000	-	2,140
Bromochloromethane	-	5,000	-	5,000	-	5,000	-	5,000	-	2,140
Bromodichloromethane	-	5,000	-	5,000	-	5,000	-	5,000	-	2,140
Bromoform	-	5,000	-	5,000	-	5,000	-	5,000	-	2,140
Bromomethane	-	10,000	-	10,000	-	10,000	-	10,000	-	4,270
2-Butanone	-	25,000	-	25,000	-	25,000	-	25,000	-	10,700
n-Butylbenzene	-	5,000	-	5,000	-	5,000	-	5,000	-	2,140
sec-Butylbenzene	-	5,000	-	5,000	-	5,000	-	5,000	-	2,140
tert-Butylbenzene	-	5,000	-	5,000	-	5,000	-	5,000	-	2,140
Carbon disulfide	-	5,000	-	5,000	-	5,000	-	5,000	-	2,140
Carbon tetrachloride	6,640	5,000	-	5,000	-	5,000	-	5,000	-	2,140
Chlorobenzene	31,200	5,000	17,900	5,000	9,570	5,000	-	5,000	-	2,140
Chlorodibromomethane	-	5,000	-	5,000	-	5,000	-	5,000	-	2,140
Chloroethane	-	10,000	-	10,000	-	10,000	-	10,000	-	4,270
2-Chloroethyl vinyl ether	-	20,000	-	20,000	-	20,000	-	20,000	-	8,550
Chloroform	-	5,000	-	5,000	-	5,000	-	5,000	-	2,140
Chloromethane	-	20,000	-	20,000	-	20,000	-	20,000	-	8,550
2-Chlorotoluene	-	5,000	-	5,000	-	5,000	-	5,000	-	2,140
4-Chlorotoluene	-	5,000	-	5,000	-	5,000	-	5,000	-	2,140
1,2-Dibromo-3-chloropropane	-	20,000	-	20,000	-	20,000	-	20,000	-	8,550
1,2-Dibromoethane	-	5,000	-	5,000	-	5,000	-	5,000	-	2,140
Dibromomethane	-	5,000	-	5,000	-	5,000	-	5,000	-	2,140
1,2-Dichlorobenzene	3,840,000	12,500	3,490,000	25,000	2,700,000	25,000	1,740,000	5,000	544,000	2,140
1,3-Dichlorobenzene	-	5,000	-	5,000	-	5,000	-	5,000	-	2,140
1,4-Dichlorobenzene	30,100	5,000	22,100	5,000	17,700	5,000	12,300	5,000	3,500	2,140
Dichlorodifluoromethane	-	10,000	-	10,000	-	10,000	-	10,000	-	4,270
1,1-Dichloroethane	-	10,000	-	10,000	-	10,000	-	10,000	-	4,270
1,2-Dichloroethane	-	5,000	-	5,000	-	5,000	-	5,000	-	2,140
1,1-Dichloroethene	-	5,000	-	5,000	-	5,000	-	5,000	-	2,140
cis-1,2-Dichloroethene	-	5,000	-	5,000	-	5,000	-	5,000	-	2,140
trans-1,2-Dichloroethene	-	5,000	-	5,000	-	5,000	-	5,000	-	2,140
1,2-Dichloropropane	-	5,000	-	5,000	-	5,000	-	5,000	-	2,140
1,3-Dichloropropane	-	5,000	-	5,000	-	5,000	-	5,000	-	2,140
2,2-Dichloropropane	-	5,000	-	5,000	-	5,000	-	5,000	-	2,140
cis-1,3-Dichloropropene	-	5,000	-	5,000	-	5,000	-	5,000	-	2,140
trans-1,3-Dichloropropene	-	5,000	-	5,000	-	5,000	-	5,000	-	2,140
1,1-Dichloropropene	-	5,000	-	5,000	-	5,000	-	5,000	-	2,140
Ethylbenzene	10,100	5,000	5,090	5,000	-	5,000	-	5,000	-	2,140
2-Hexanone	-	2,500	-	25,000	-	25,000	-	25,000	-	10,700
Hexachlorobutadiene	11,900	5,000	10,500	5,000	10,600	5,000	9,030	5,000	5,570	2,140
Isopropylbenzene	15,000	5,000	9,390	5,000	7,340	5,000	5,280	5,000	-	2,140
p-Isopropyltoluene	-	5,000	-	5,000	-	5,000	-	5,000	-	2,140
4-Methyl-2-pentanone	-	2,500	-	25,000	-	25,000	-	25,000	-	10,700
Methylene chloride	-	10,000	-	10,000	-	10,000	-	10,000	-	4,270
Naphthalene	132,000	5,000	-	5,000	-	5,000	-	5,000	-	2,140
n-Propylbenzene	-	5,000	-	5,000	-	5,000	-	5,000	-	2,140
Styrene		5,000	-	5,000	-	5,000	-	5,000	-	2,140
1,1,1,2-Tetrachloroethane	-	5,000	-	5,000	-	5,000	-	5,000	-	2,140
1,1,2,2-Tetrachloroethane	197,000	5,000	133,000	5,000	87,800	5,000	43,200	5,000	15,300	2,140
Tetrachloroethene	977,000	5,000	590,000	5,000	330,000	5,000	135,000	5,000	33,000	2,140
Toluene	36,400	5,000	17,300	5,000	7,220	5,000	-	5,000	-	2,140
1,2,3-Trichlorobenzene	-	5,000	-	5,000	-	5,000	-	5,000	-	2,140
1,2,4-Trichlorobenzene	-	5,000	-	5,000	-	5,000	-	5,000	-	2,140
1,1,1-Trichloroethane	-	5,000	-	5,000	-	5,000	-	5,000	-	2,140
1,1,2-Trichloroethane	-	5,000	-	5,000	-	5,000	-	5,000	-	2,140
Trichloroethene	69,800	5,000	25,700	5,000	10,600	5,000	-	5,000	3,410	2,140
Trichlorofluoromethane	-	10,000	-	10,000	-	10,000	-	10,000	-	4,270
1,2,3-Trichloropropane	-	5,000	-	10,000	-	10,000	-	10,000	-	4,270
1,2,4-Trimethylbenzene	-	5,000	-	5,000	-	5,000	-	5,000	-	2,140
1,3,5-Trimethylbenzene	-	5,000	-	5,000	-	5,000	-	5,000	-	2,140
Vinyl acetate	-	10,000	-	10,000	-	10,000	-	10,000	-	4,270
Vinyl chloride	-	10,000	-	10,000	-	10,000	-	10,000	-	4,270
o-Xylene	7,990	5,000	-	5,000	-	5,000	-	5,000	-	2,140
m, p -Xylene	39,000	5,000	21,300	5,000	12,700	5,000	5,370	5,000	-	2,140
	(µg/Kg)		(µg/Kg)	Percent Removal	(µg/Kg)	Percent Removal	(µg/Kg)	Percent Removal	(µg/Kg)	Percent Removal
Total VOCs	5,450,330		4,355,880		3,193,530		1,950,180		604,780	
Total Percent Removal				20.1%		41.4%		64.2%		88.9%
Rate of Removal Over Time (% Removal/Minute)				2%		1%		1%		1%

Note: From Draft Kemron Table 10

Table 4 (Revised)
S/S/S Treatability Study
Phase III VOC Confirmation Testing Results
Summary of Total Volatiles Analyses - EPA Method 8260B
Nease Chemical Site
Salem, Ohio

TOTAL VOLATILES	AIR STRIPPING: 21 Day Cure								ZERO VALENT IRON: 21 Day Cure							
	Air Stripping[1] Control (µg/Kg)		Cement & Flyash[2]			Cement & Lime Kiln Dust[2]			Zero Valent Iron[1] Control (µg/Kg)		Cement & Flyash[2]			Cement & Lime Kiln Dust[2]		
			0190-15 AS (µg/Kg)		Percent Removal	0190-016 AS (µg/Kg)		Percent Removal			0190-017 ZVI (µg/Kg)		Percent Removal	0190-018 ZVI (µg/Kg)		Percent Removal
	Result	DL	Result	DL	%	Result	DL	%	Result	DL	Result	DL	%	Result	DL	%
Acetone	25,000	50,000	1,260	2,520	95%	690	1,380	97%	16,500	33,000	2,510	5,020	85%	1,470	2,940	91%
Benzene	46,200	5,000	497	252	99%	311	138	99%	31,500	3,300	251	502	99%	147	294	100%
Bromobenzene	2,500	5,000	126	252	95%	69	138	97%	1,650	3,300	251	502	85%	147	294	91%
Bromochloromethane	2,500	5,000	126	252	95%	69	138	97%	1,650	3,300	251	502	85%	147	294	91%
Bromodichloromethane	2,500	5,000	126	252	95%	69	138	97%	1,650	3,300	251	502	85%	147	294	91%
Bromoform	2,500	5,000	126	252	95%	69	138	97%	1,650	3,300	251	502	85%	147	294	91%
Bromomethane	5,000	10,000	252	504	95%	138	276	97%	3,300	6,600	500	1,000	85%	294	587	91%
2-Butanone	12,500	25,000	630	1,260	95%	345	690	97%	8,250	16,500	1,255	2,510	85%	735	1,470	91%
n-Butylbenzene	2,500	5,000	126	252	95%	69	138	97%	1,650	3,300	251	502	85%	147	294	91%
sec-Butylbenzene	2,500	5,000	126	252	95%	69	138	97%	1,650	3,300	251	502	85%	147	294	91%
tert-Butylbenzene	2,500	5,000	126	252	95%	69	138	97%	1,650	3,300	251	502	85%	147	294	91%
Carbon disulfide	2,500	5,000	126	252	95%	69	138	97%	1,650	3,300	251	502	85%	147	294	91%
Carbon tetrachloride	6,640	5,000	126	252	98%	69	138	99%	4,370	3,300	251	502	94%	147	294	97%
Chlorobenzene	31,200	5,000	287	252	99%	183	138	99%	20,400	3,300	251	502	99%	147	294	99%
Chlorodibromomethane	2,500	5,000	126	252	95%	69	138	97%	1,650	3,300	251	502	85%	147	294	91%
Chloroethane	5,000	10,000	252	504	95%	138	276	97%	3,300	6,600	500	1,000	85%	294	587	91%
2-Chloroethyl vinyl ether	10,000	20,000	505	1,010	95%	276	552	97%	6,600	13,200	1,005	2,010	85%	585	1,170	91%
Chloroform	2,500	5,000	126	252	95%	69	138	97%	1,650	3,300	251	502	85%	147	294	91%
Chloromethane	10,000	20,000	505	1,010	95%	276	552	97%	6,600	13,200	1,005	2,010	85%	585	1,170	91%
2-Chlorotoluene	2,500	5,000	126	252	95%	69	138	97%	1,650	3,300	251	502	85%	147	294	91%
4-Chlorotoluene	2,500	5,000	126	252	95%	69	138	97%	1,650	3,300	251	502	85%	147	294	91%
1,2-Dibromo-3-chloropropane	10,000	20,000	505	1,010	95%	276	552	97%	6,600	13,200	1,005	2,010	85%	585	1,170	91%
1,2-Dibromoethane	2,500	5,000	126	252	95%	69	138	97%	1,650	3,300	251	502	85%	147	294	91%
Dibromomethane	2,500	5,000	126	252	95%	69	138	97%	1,650	3,300	251	502	85%	147	294	91%
1,2-Dichlorobenzene	3,840,000	12,500	75,800	252	98%	48,700	138	99%	2,690,000	8,250	114,000	502	96%	56,500	294	98%
1,3-Dichlorobenzene	2,500	5,000	126	252	95%	69	138	97%	1,650	3,300	251	502	85%	147	294	91%
1,4-Dichlorobenzene	30,100	5,000	612	252	98%	374	138	99%	19,500	3,300	934	502	95%	432	294	98%
Dichlorodifluoromethane	5,000	10,000	252	504	95%	138	276	97%	3,300	6,600	500	1,000	85%	294	587	91%
1,1-Dichloroethane	5,000	10,000	252	504	95%	138	276	97%	3,300	6,600	500	1,000	85%	294	587	91%
1,2-Dichloroethane	2,500	5,000	126	252	95%	139	138	94%	1,650	3,300	251	502	85%	147	294	91%
1,1-Dichloroethene	2,500	5,000	126	252	95%	69	138	97%	1,650	3,300	251	502	85%	147	294	91%
cis-1,2-Dichloroethene	2,500	5,000	126	252	95%	69	138	97%	1,650	3,300	251	502	85%	147	294	91%
trans-1,2-Dichloroethene	2,500	5,000	126	252	95%	69	138	97%	1,650	3,300	251	502	85%	147	294	91%
1,2-Dichloropropane	2,500	5,000	126	252	95%	69	138	97%	1,650	3,300	251	502	85%	147	294	91%
1,3-Dichloropropane	2,500	5,000	126	252	95%	69	138	97%	1,650	3,300	251	502	85%	147	294	91%
2,2-Dichloropropane	2,500	5,000	126	252	95%	69	138	97%	1,650	3,300	251	502	85%	147	294	91%
cis-1,3-Dichloropropene	2,500	5,000	126	252	95%	69	138	97%	1,650	3,300	251	502	85%	147	294	91%
trans-1,3-Dichloropropene	2,500	5,000	126	252	95%	69	138	97%	1,650	3,300	251	502	85%	147	294	91%
1,1-Dichloropropene	2,500	5,000	126	252	95%	69	138	97%	1,650	3,300	251	502	85%	147	294	91%
Ethylbenzene	10,100	5,000	126	252	99%	69	138	99%	6,250	3,300	251	502	96%	147	294	98%
2-Hexanone	1,250	2,500	630	1,260	50%	345	690	72%	8,250	16,500	1,255	2,510	85%	735	1,470	91%
Hexachlorobutadiene	11,900	5,000	1,160	252	90%	1,220	138	90%	7,940	3,300	930	502	88%	769	294	90%
Isopropylbenzene	15,000	5,000	126	252	99%	69	138	100%	9,310	3,300	251	502	97%	147	294	98%
p-Isopropyltoluene	2,500	5,000	126	252	95%	69	138	97%	1,650	3,300	251	502	85%	147	294	91%
4-Methyl-2-pentanone	1,250	2,500	630	1,260	50%	345	690	72%	8,250	16,500	1,255	2,510	85%	735	1,470	91%
Methylene chloride	5,000	10,000	252	504	95%	138	276	97%	3,300	6,600	500	1,000	85%	294	587	91%
Naphthalene	132,000	5,000	126	252	100%	69	138	100%	5,520	3,300	251	502	95%	147	294	97%
n-Propylbenzene	2,500	5,000	126	252	95%	69	138	97%	1,650	3,300	251	502	85%	147	294	91%
Styrene	2,500	5,000	126	252	95%	151	138	94%	1,650	3,300	251	502	85%	147	294	91%
1,1,1,2-Tetrachloroethane	2,500	5,000	126	252	95%	69	138	97%	1,650	3,300	251	502	85%	147	294	91%
1,1,2,2-Tetrachloroethane	197,000	5,000	126	252	100%	69	138	100%	126,000	3,300	251	502	100%	147	294	100%
Tetrachloroethene	977,000	5,000	10,400	252	99%	6,230	138	99%	648,000	3,300	16,800	502	97%	6,140	294	99%
Toluene	36,400	5,000	291	252	99%	159	138	100%	23,700	3,300	251	502	99%	147	294	99%
1,2,3-Trichlorobenzene	2,500	5,000	126	252	95%	69	138	97%	1,650	3,300	251	502	85%	147	294	91%
1,2,4-Trichlorobenzene	2,500	5,000	126	252	95%	172	138	93%	1,650	3,300	251	502	85%	147	294	91%
1,1,1-Trichloroethane	2,500	5,000	126	252	95%	69	138	97%	1,650	3,300	251	502	85%	147	294	91%
1,1,2-Trichloroethane	2,500	5,000	126	252	95%	69	138	97%	1,650	3,300	251	502	85%	147	294	91%
Trichloroethene	69,800	5,000	3,730	252	95%	1,690	138	98%	49,600	3,300	2,150	502	96%	1,330	294	97%
Trichlorofluoromethane	5,000	10,000	252	504	95%	138	276	97%	3,300	6,600	500	1,000	85%	294	587	91%
1,2,3-Trichloropropane	2,500	5,000	252	504	90%	138	276	94%	3,300	6,600	500	1,000	85%	294	587	91%
1,2,4-Trimethylbenzene	2,500	5,000	126	252	95%	69	138	97%	1,650	3,300	251	502	85%	147	294	91%
1,3,5-Trimethylbenzene	2,500	5,000	126	252	95%	69	138	97%	1,650	3,300	251	502	85%	147	294	91%
Vinyl acetate	5,000	10,000	252	504	95%	138	276	97%	3,300	6,600	500	1,000	85%	294	587	91%
Vinyl chloride	5,000	10,000	252	504	95%	138	276	97%	3,300	6,600	500	1,000	85%	294	587	91%
o-Xylene	7,990	5,000	126	252	98%	69	138	99%	4,750	3,300	251	502	95%	147	294	97%
m, p -Xylene	39,000	5,000	126	252	100%	145	138	100%	24,500	3,300	519	502	98%	147	294	99%
	5,650,330		105,002		98%	65,891	14,490	99%	3,819,840		160,167		97%	79,858	30,843	99%

Notes:

1 Air Stripping Control laboratory results from draft Kemron Table 8.

2 Cement & Flyash and Cement & Lime Kiln Dust laboratory results from draft Kemron Table 13.

3 Red results denote non-detects that are listed as 1/2 the reporting limit (i.e.,126)

Table 4a (Revised)
S/S/S Treatability Study
Phase III SPLP Confirmation Testing Results
Summary of SPLP Analyses - EPA Method 1312/8260B
Nease Chemical Site
Salem, Ohio

	AIR STRIPPING: 21 Day Cure								ZERO VALENT IRON: 21 Day Cure							
	Air Stripping[1] Control (µg/Kg)		Cement & Flyash[2]			Cement & Lime Kiln Dust[2]			Zero Valent Iron[1] Control (µg/Kg)		Cement & Flyash[2]			Cement & Lime Kiln Dust[2]		
			0190-15 AS (µg/Kg)		Percent Removal	0190-016 AS (µg/Kg)		Percent Removal			0190-017 ZVI (µg/Kg)		Percent Removal	0190-018 ZVI (µg/Kg)		Percent Removal
SPLP VOLATILES	Result	DL	Result	DL	%	Result	DL	%	Result	DL	Result	DL	%	Result	DL	%
Acetone	625	1,250	130	125	79%	25	50	96%	625	1,250	250	500	60%	250	500	60%
Benzene	1,410	62.5	3	6.3	100%	8.61	2.5	99%	1,770	62.5	13	25	99%	13	25	99%
Bromobenzene	31	62.5	3	6.3	90%	1	2.5	96%	31	62.5	13	25	60%	13	25	60%
Bromochloromethane	50	100	5	10	90%	2	4	96%	50	100	20	40	60%	20	40	60%
Bromodichloromethane	63	125	6	12.5	90%	3	5	96%	63	125	25	50	60%	25	50	60%
Bromoform	125	250	13	25	90%	5	10	96%	125	250	50	100	60%	50	100	60%
Bromomethane	125	250	13	25	90%	5	10	96%	125	250	50	100	60%	50	100	60%
2-Butanone	625	1,250	63	125	90%	25	50	96%	625	1,250	250	500	60%	250	500	60%
n-Butylbenzene	63	125	6	12.5	90%	3	5	96%	63	125	25	50	60%	25	50	60%
sec-Butylbenzene	63	125	6	12.5	90%	3	5	96%	63	125	25	50	60%	25	50	60%
tert-Butylbenzene	63	125	6	12.5	90%	3	5	96%	63	125	25	50	60%	25	50	60%
Carbon disulfide	125	250	13	25	90%	5	10	96%	125	250	50	100	60%	50	100	60%
Carbon tetrachloride	63	125	6	12.5	90%	3	5	96%	63	125	25	50	60%	25	50	60%
Chlorobenzene	890	62.5	3	6.3	100%	6.57	2.5	99%	1,090	62.5	62.1	25	94%	46.8	25	96%
Chlorodibromomethane	63	125	6	12.5	90%	3	5	96%	63	125	25	50	60%	25	50	60%
Chloroethane	125	250	13	25	90%	5	10	96%	125	250	50	100	60%	50	100	60%
2-Chloroethyl vinyl ether	2,500	5,000	250	500	90%	100	200	96%	2,500	5,000	1,000	2000	60%	1,000	2000	60%
Chloroform	31	62.5	3	6.3	90%	1	2.5	96%	31	62.5	13	25	60%	13	25	60%
Chloromethane	63	125	6	12.5	90%	3	5	96%	63	125	25	50	60%	25	50	60%
2-Chlorotoluene	31	62.5	3	6.3	90%	1	2.5	96%	31	62.5	13	25	60%	13	25	60%
4-Chlorotoluene	63	125	6	12.5	90%	3	5	96%	63	125	25	50	60%	25	50	60%
1,2-Dibromo-3-chloropropane	250	500	25	50	90%	10	20	96%	250	500	100	200	60%	100	200	60%
1,2-Dibromoethane	63	125	6	12.5	90%	3	5	96%	63	125	25	50	60%	25	50	60%
Dibromomethane	63	125	6	12.5	90%	3	5	96%	63	125	25	50	60%	25	50	60%
1,2-Dichlorobenzene	67,800	62.5	4,090	6.3	94%	3,360	2.5	95%	69,400	62.5	30,400	25	56%	33,900	25	51%
1,3-Dichlorobenzene	63	125	6	12.5	90%	3	5	96%	63	125	25	50	60%	25	50	60%
1,4-Dichlorobenzene	522	62.5	20.7	6.3	96%	19.3	2.5	96%	530	62.5	202	25	62%	230	25	57%
Dichlorodifluoromethane	63	125	6	12.5	90%	3	5	96%	63	125	25	50	60%	25	50	60%
1,1-Dichloroethane	31	62.5	3	6.3	90%	1	2.5	96%	31	62.5	13	25	60%	13	25	60%
1,2-Dichloroethane	166	125	6	12.5	96%	5.07	5	97%	208	125	25	50	88%	25	50	88%
1,1-Dichloroethene	125	250	13	25	90%	5	10	96%	125	250	50	100	60%	50	100	60%
cis-1,2-Dichloroethene	63	125	6	12.5	90%	3	5	96%	63	125	25	50	60%	25	50	60%
trans-1,2-Dichloroethene	63	125	6	12.5	90%	3	5	96%	63	125	25	50	60%	25	50	60%
1,2-Dichloropropane	50	100	5	10	90%	2	4	96%	50	100	20	40	60%	20	40	60%
1,3-Dichloropropane	50	100	5	10	90%	2	4	96%	50	100	20	40	60%	20	40	60%
2,2-Dichloropropane	63	125	6	12.5	90%	3	5	96%	63	125	25	50	60%	25	50	60%
cis-1,3-Dichloropropene	63	125	6	12.5	90%	3	5	96%	63	125	25	50	60%	25	50	60%
trans-1,3-Dichloropropene	125	250	13	25	90%	5	10	96%	125	250	50	100	60%	50	100	60%
1,1-Dichloropropene	63	125	6	12.5	90%	3	5	96%	63	125	25	50	60%	25	50	60%
Ethylbenzene	190	125	6	12.5	97%	3	5	99%	242	125	25	50	90%	25	50	90%
2-Hexanone	625	1,250	63	125	90%	25	50	96%	625	1,250	250	500	60%	250	500	60%
Hexachlorobutadiene	63	125	6	12.5	90%	14.5	5	77%	63	125	25	50	60%	25	50	60%
Isopropylbenzene	148	125	6	12.5	96%	3	5	98%	138	125	56.4	50	59%	59.3	50	57%
p-Isopropyltoluene	63	125	6	12.5	90%	3	5	96%	63	125	25	50	60%	25	50	60%
4-Methyl-2-pentanone	625	1,250	63	125	90%	25	50	96%	625	1,250	250	500	60%	250	500	60%
Methylene chloride	63	125	6	12.5	90%	3	5	96%	63	125	25	50	60%	25	50	60%
Naphthalene	50	100	5	10	90%	5.42	4	89%	50	100	20	40	60%	20	40	60%
n-Propylbenzene	31	62.5	3	6.3	90%	1	2.5	96%	31	62.5	13	25	60%	13	25	60%
Styrene	31	62.5	3	6.3	90%	1	2.5	96%	31	62.5	13	25	60%	13	25	60%
1,1,1,2-Tetrachloroethane	63	125	6	12.5	90%	3	5	96%	63	125	25	50	60%	25	50	60%
1,1,2,2-Tetrachloroethane	6,250	62.5	3	6.3	100%	1	2.5	100%	9,010	62.5	13	25	100%	13	25	100%
Tetrachloroethene	23,200	125	74.9	12.5	100%	128	5	99%	24,000	125	2,220	50	91%	1,700	50	93%
Toluene	1,020	125	6	12.5	99%	5.45	5	99%	1,280	125	25	50	98%	25	50	98%
1,2,3-Trichlorobenzene	31	62.5	3	6.3	90%	1	2.5	96%	31	62.5	13	25	60%	13	25	60%
1,2,4-Trichlorobenzene	50	100	5	10	90%	7.96	4	84%	50	100	20	40	60%	20	40	60%
1,1,1-Trichloroethane	63	125	6	12.5	90%	3	5	96%	63	125	25	50	60%	25	50	60%
1,1,2-Trichloroethane	63	125	6	12.5	90%	3	5	96%	63	125	25	50	60%	25	50	60%
Trichloroethene	2,130	125	19.8	12.5	99%	40.8	5	98%	2,600	125	76.1	50	97%	25	50	99%
Trichlorofluoromethane	63	125	6	12.5	90%	3	5	96%	63	125	25	50	60%	25	50	60%
1,2,3-Trichloropropane	125	250	13	25	90%	5	10	96%	125	250	50	100	60%	50	100	60%
1,2,4-Trimethylbenzene	63	125	6	12.5	90%	3	5	96%	63	125	25	50	60%	25	50	60%
1,3,5-Trimethylbenzene	63	125	6	12.5	90%	3	5	96%	63	125	25	50	60%	25	50	60%
Vinyl acetate	625	1,250	63	125	90%	25	50	96%	625	1,250	250	500	60%	250	500	60%
Vinyl chloride	63	125	6	12.5	90%	3	5	96%	63	125	25	50	60%	25	50	60%
o-Xylene	144	125	6	12.5	96%	3	5	98%	161	125	25	50	84%	25	50	84%
m, p -Xylene	783	125	6	12.5	99%	3	5	100%	842	125	115	50	86%	109	50	87%
	113,559		5,210		95%	3,963		97%	120,177		36,819		69%	39,758		67%

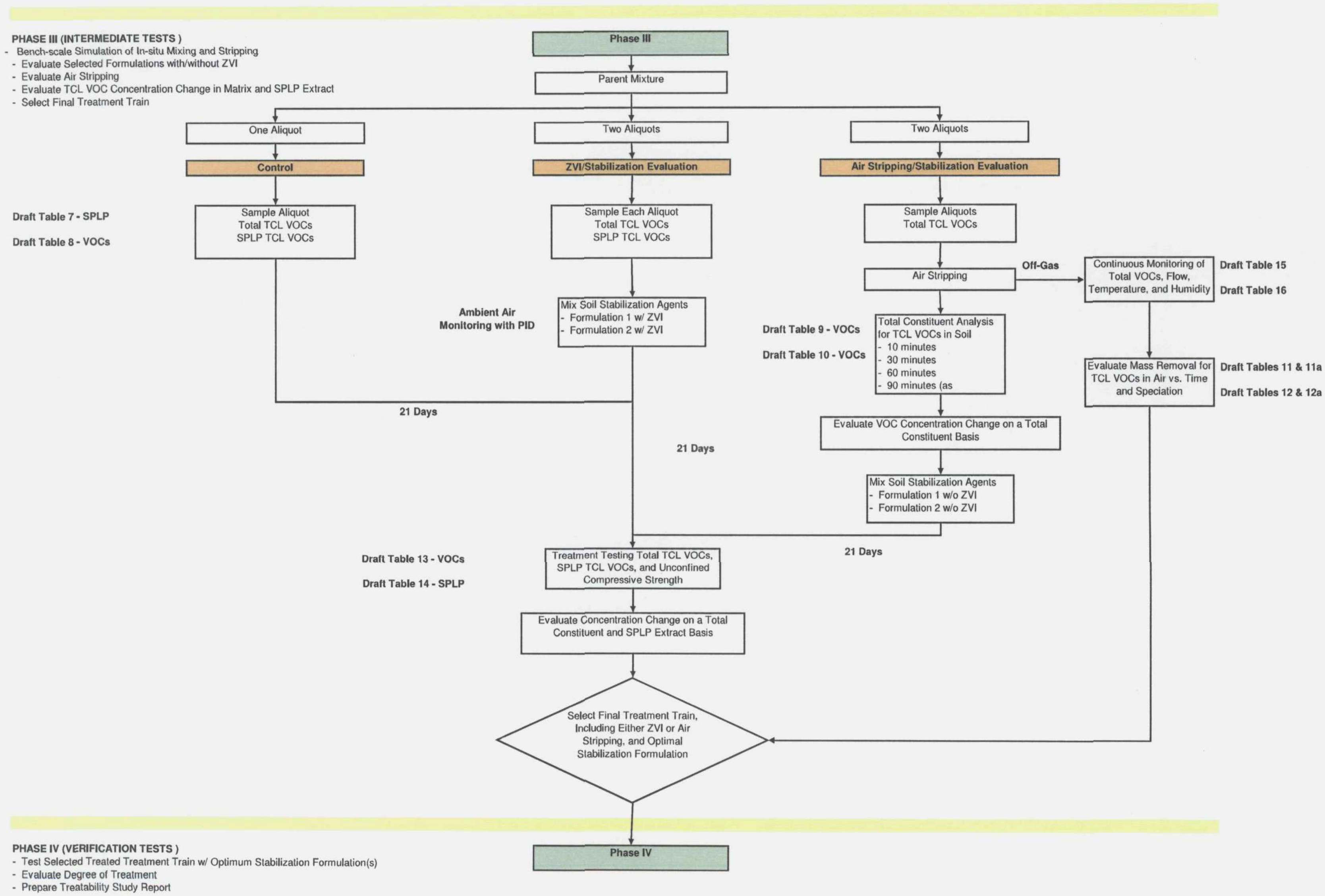
Notes:

[1] Air Stripping Control laboratory results from draft Kemron Table 7.

[2] Cement & Flyash and Cement & Lime Kiln Dust laboratory results from draft Kemron Table 14.

[3] Red results denote non-detects that are listed as 1/2 the reporting limit (i.e., 126)

Figure 1 (Revised)
Rutgers-Salem S/S/S Treatability Study
Phase III Intermediate Tests



Note:
Draft Tables are from forthcoming treatability study report.

Figure 2
Nease Chemical Site - S/S/S Treatability Study
Phase III Air Stripping - Sample SE0190-015
PID Results in Air and Total VOC Results in Soil Over Time

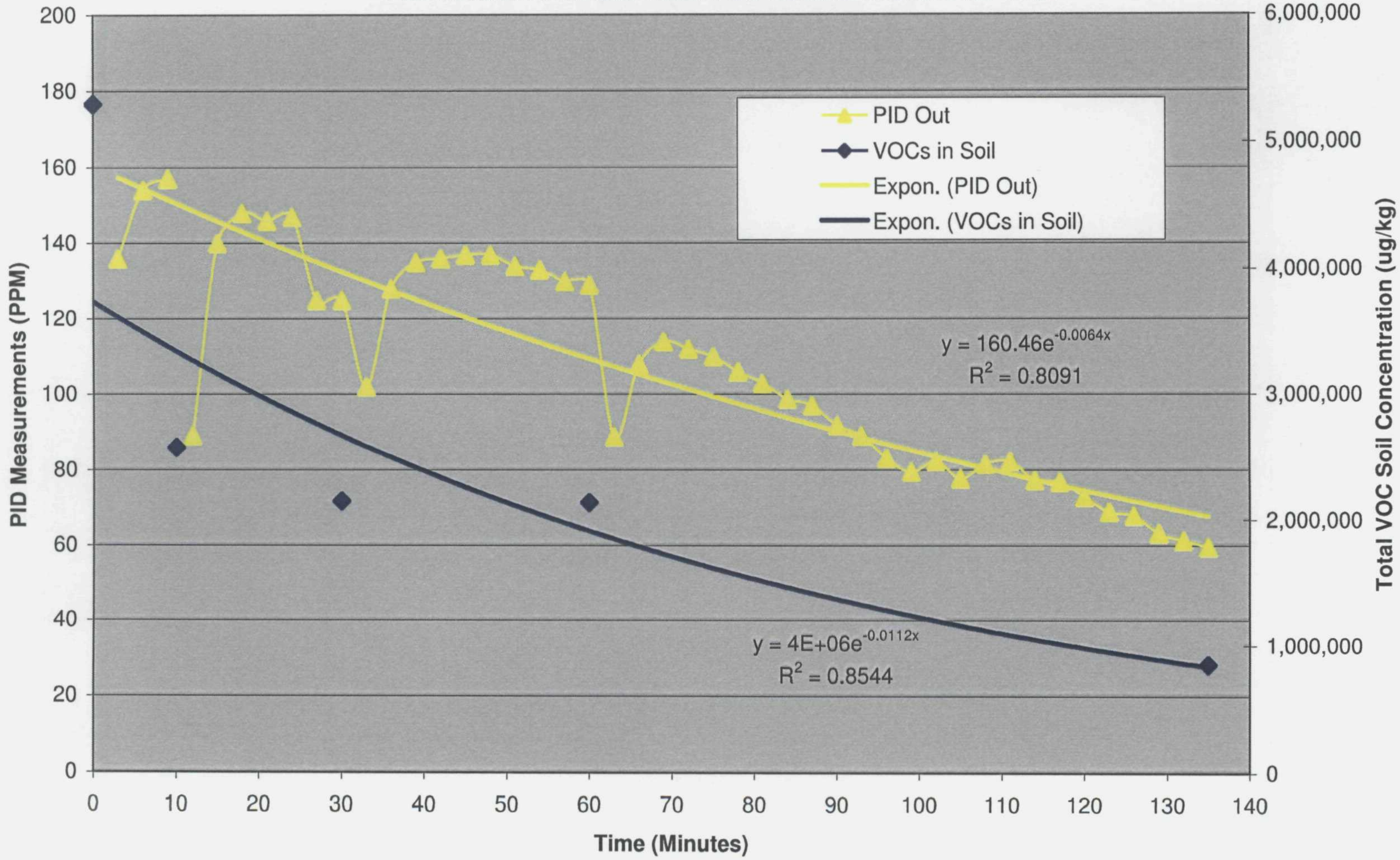


Figure 3
Nease Chemical Site - S/S/S Treatability Study
Phase III Air Stripping - Sample SE0190-016
PID Results and Total VOC Results in Soil Over Time

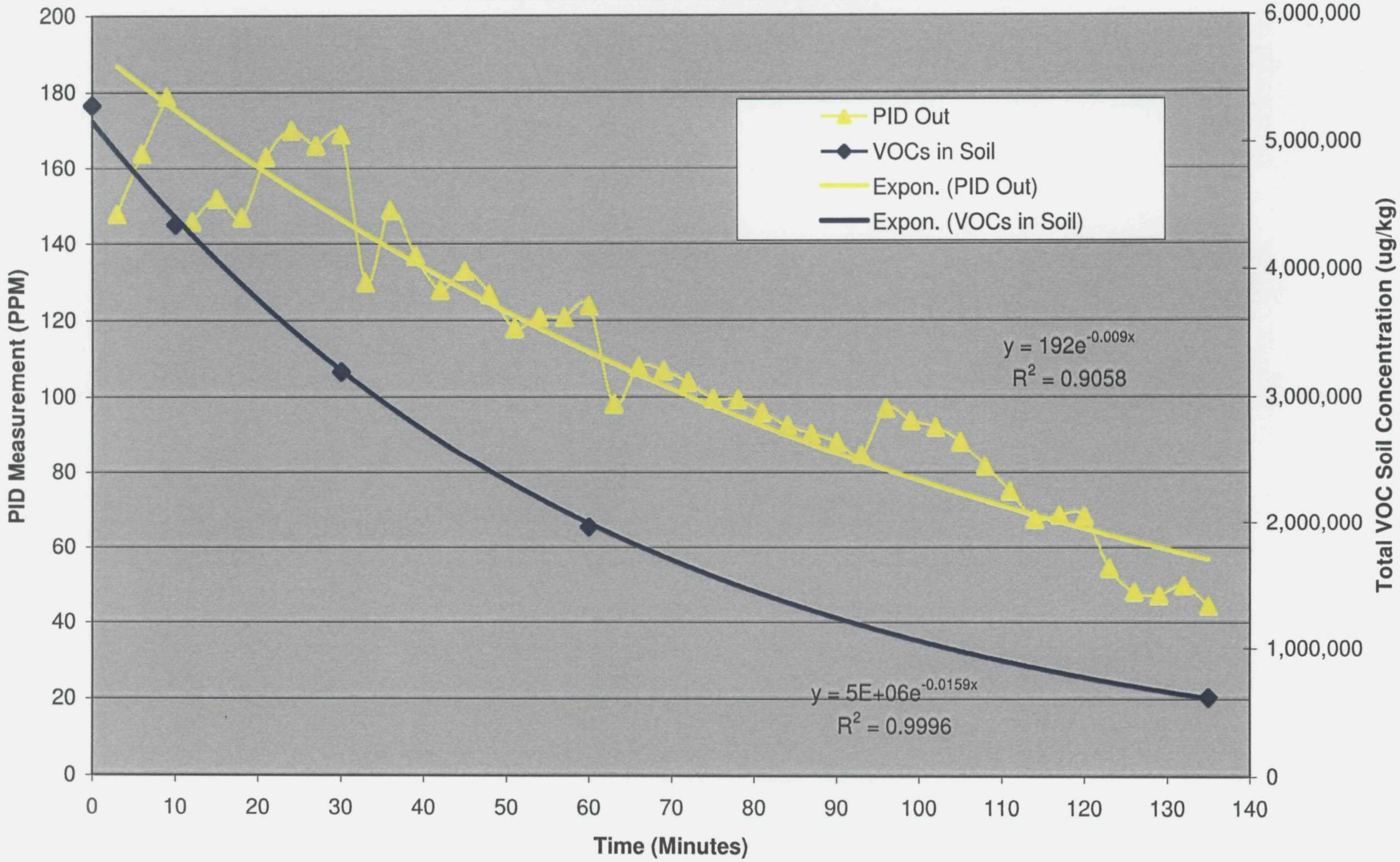


Figure 4
Nease Chemical Site - S/S/S Treatability Study
Phase III Air Stripping - Sample SE0190-015
Total VOC Results in Soil Over Time

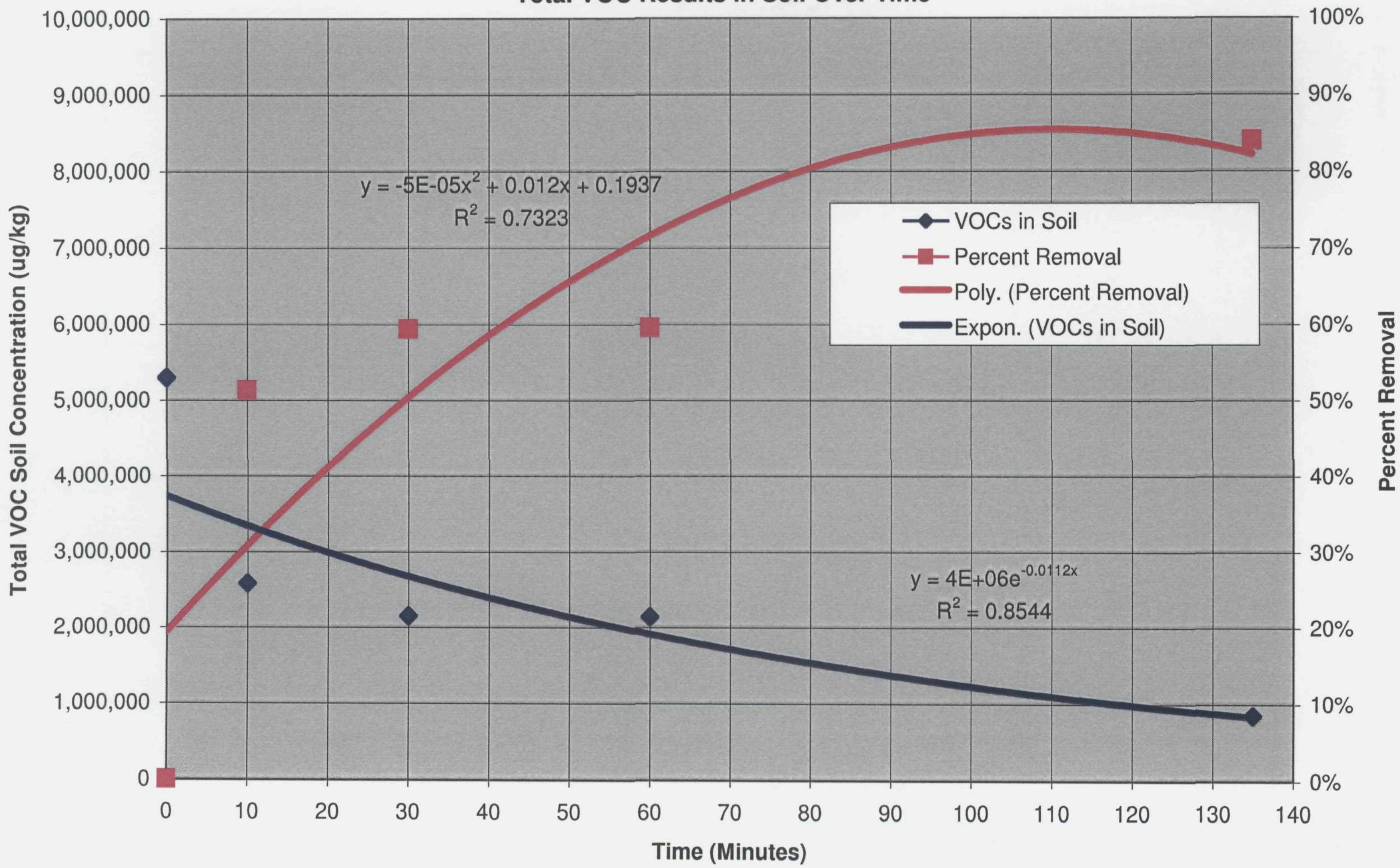
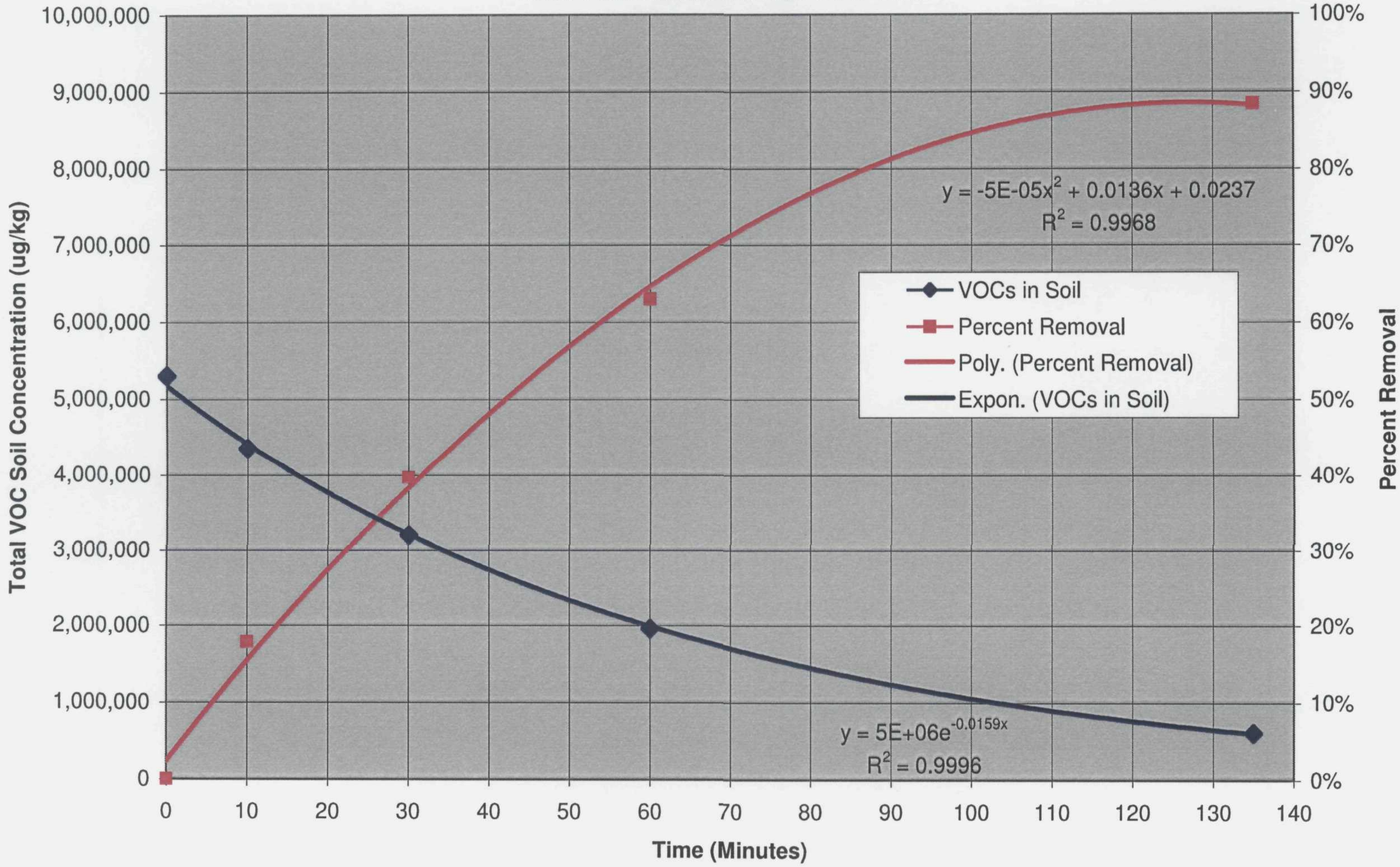


Figure 5
Nease Chemical Site - S/S/S Treatability Study
Phase III Air Stripping - Sample SE0190-016
Total VOC Results in Soil Over Time



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Golder Associates

TRANSMITTAL LETTER

To: **Mary Logan**
USEPA (SR-6J)
77 West Jackson Blvd.
Chicago, IL 60604

Date: July 12, 2007

Project No.: 933-6154

Sent by:

[ ] Mail
[ ] Courier
[ ] Hand Carried
[ ] Under Separate Cover
[X] Federal Express
[ ] Enclosed

Quantity	Item	Description
1	Copy	S/S/S Treatability Study Phase III Results, RUTGERS Organics Corporation, Nease Chemical Site, Salem, Ohio

Remarks:

cc: Luanne Vanderpool, 1 copy
Sheila Abraham, 1 copy
Tim Christman, 1 copy
Kevin Palombo. 1 copy

Per: Allen Kane/Steve Finn

TECHNICAL MEMORANDUM

TO:	Mary Logan, USEPA	**DATE:**	July 12, 2007
FR:	Joe Gormley, Randy White, Steve Finn	**OUR REF:**	933-6154
RE:	**STRIPPING/STABILIZATION/SOLIDIFICATION (S/S/S) TREATABILITY STUDY PHASE III RESULTS, NEASE CHEMICAL SITE, SALEM, OHIO (REVISED)**		

The purpose of this memorandum is to provide a status update of the Stripping/ Stabilization/Solidification (S/S/S) Treatability Study, including the Phase III results, and to propose the treatment method and reagent formulation for USEPA/Ohio EPA approval before proceeding with the final phase (IV) of the Study.

1.0 SCOPE/OBJECTIVES

The scope of the Treatability Study is described in the Pre-Design Investigation Work Plan (PDI Work Plan; Golder Associates, September 2006). The overall objective of the S/S/S technology is to reduce the chemical leachability of the treated volume to mitigate future releases of chemicals to groundwater from former Ponds 1 and 2. The primary objective of the S/S/S Treatability Study is to determine the most appropriate methods and admixtures for full-scale operation that will result in adequate strength (to support the construction of a geosynthetic cap) and substantial reduction of chemical leachability.

The treatability testing is being conducted in four phases:

- Phase I – Field Sampling and Baseline Characterization;
- Phase II – Screening Tests;
- Phase III – Intermediate Tests; and
- Phase IV – Verification Tests.

During Phase I, Golder Associates identified an area in former Pond 2 that exhibited elevated chemical impacts and, with USEPA/Ohio EPA approval, collected samples from this location for use in the S/S/S treatability study. After receiving the samples, the laboratory homogenized the material to create a "parent mixture" while seeking to minimize loss of volatiles and performed baseline physical, chemical, and leachability (SPLP) testing to define the characteristics of the untreated material and to confirm that it represented the material observed in the field.

In Phase II, the parent mixture was treated with 10 different stabilization/ solidification (S/S) admixture formulations to determine the strength properties of the mixtures. Based on these test results, and with the approval of the USEPA/Ohio EPA, the following two admixtures were selected for further evaluation:

- 7.5% Portland Cement / 15% Class "C" Flyash; and
- 7.5% Portland Cement / 15% Lime Kiln Dust.

2.0 PHASE III TESTING

Phase III - Intermediate Testing was designed to determine the benefits of in-situ air stripping of the soils prior to solidification/stabilization (S/S), as well as the potential benefits of zero-valent iron (ZVI) amendments to the formulations selected in Phase II. As defined in the PDI Work Plan, the primary goals of Phase III were the following:

- to compare the treatment benefits of air stripping versus ZVI addition;
- to evaluate total constituent and SPLP concentration reduction achieved by the selected S/S formulations; and
- to ultimately select the final treatment approach for verification testing in Phase IV.

The steps of Phase III testing are shown in Figure 1 and described below.

2.1 Air Stripping Evaluation

A portion of the initial parent mixture was selected for the air stripping evaluation and submitted for total constituent and SPLP analysis of TCL VOCs. The results for these analyses were comparable to the results for the initial analyses of the parent material (see Tables 1 and 1a).

Two aliquots (SE0190-015 and SE0190-016) were then subjected to a bench-scale simulation of in-situ air stripping. To simulate air stripping, the soils were mixed using a Hobart mixer in a sealed glove box and maintained at approximately 55°F. Flow rate, temperature, and humidity of the influent and effluent air were continuously recorded. VOCs emitted during the mixing were carried by the sweep gas out of the glove box to an absorbent carbon cartridge. A sampling tee upstream from the carbon was used to continuously monitor total VOC concentrations of the sweep gas with a PID. Figures 2 and 3 show the PID concentrations over time for the two aliquots. Excel® was used to apply trendlines to the data shown on the figures. The sudden drops in PID readings are associated with sampling episodes as described below.

Samples from the treated soils were collected at elapsed times of approximately 10, 30, and 60 minutes after the start of mixing/air stripping and analyzed for total constituent concentrations of TCL VOCs. The soil sample analyses results are summarized in Tables 2 and 3 and Figures 2 and 3 show the soil concentrations in relation to the PID readings. Applying trendlines with best fit to these figures shows that the soil concentration (as well as PID results) appear to be decreasing exponentially. Figures 4 and 5 plot the decrease in soil concentration along with the percent removal. From these figures it can be seen that greater than 80 percent of total VOCs were removed from the material in approximately 90 minutes.

2.2 ZVI Evaluation

A portion of the initial parent mixture was selected for the ZVI evaluation and analyzed for TCL VOCs on a total constituent concentration basis, as well as in SPLP extracts. The results were comparable to those for the initial analysis of the parent material (see Tables 1 and 1a). Two aliquots of the ZVI parent mixture (SE0190-017 and SE0190-018) were then treated with the addition of granular (40 µm-1,200 µm) ZVI. The ZVI was added to the samples in amounts corresponding to approximately five times the stoichiometric amount estimated for treatment of all VOCs and SVOCs (as determined in "parent" baseline sampling).

2.3 Control Samples

A control sample was taken from the parent material at the beginning of Phase III testing (Untreated Control - Day 0). The total VOC and SPLP results for this control sample are shown in Tables 1 and 1a and indicate lower levels of contaminants then any of the treatment samples. The untreated control sample was then placed in a zip lock bag and stored at room temperature for 21 days. After 21 days a sample was collected (Untreated Control - Day 21) and submitted for total constituent and SPLP analysis of TCL VOCs (refer to Tables 1 and 1a). The untreated control sample results for the 21 day sample show significant decreases in total VOCs and a lesser decrease in SPLP VOCs over the same time period. These changes may be related to volatilization, heterogeneity of the material, or sampling procedures.

2.4 Formulation Evaluation

Following air stripping and ZVI addition, the stripped samples (SE0190-015 and SE0190-016) and the two ZVI treated samples (SE0190-017 and SE0190-018) were mixed with the selected stabilization agents (7.5% Portland Cement/15% Class C Fly Ash and 7.5% Portland Cement/15% Lime Kiln dust) and allowed to cure for 21 days. After 21 days, the samples were analyzed for concentrations of TCL VOCs on a total constituent concentration basis and in the SPLP extract. The results for these analyses along with percent removals are summarized on Tables 4 and 4a.

3.0 CONCLUSIONS/NEXT STEPS

3.1 Conclusions

The results of Phase III testing demonstrate the following:

- The optimum duration for air stripping was 90 minutes.
- Both the air stripping and ZVI treatment trains provided significant percent reductions in total VOCs; however, the air stripping treatment train provided significantly greater percent reductions in leachability compared to the ZVI treatment;
- The Cement/Class C Fly Ash and the Cement/Lime Kiln Dust formulations provided similar percent reductions in total VOCs and leachable VOCs; and
- Air stripping along with either the Cement/Fly Ash or the Cement/Lime Kiln Dust formulation appears to provide the best treatment and stabilization formulation for meeting the goal of mitigating future release of chemicals to groundwater from former Ponds 1 and 2.
- Prior to the next phase, the parent material proposed for Phase IV testing should be tested for total VOC analysis on a fast turn-around basis to verify that a representative sample of the site material is being treated.

3.2 Next Steps

Subject to USEPA/Ohio EPA approval, Golder Associates proposes to perform Phase IV verification testing on two samples in the following manner:

- Perform rapid-turn-around TCL VOC analysis of both samples to verify that the testing will be performed on representative material;
- Perform total TCL semi-VOC, SPLP TCL VOCs, and SPLP TCL semi-VOC analyses to define the baseline condition;
- Perform air stripping on one sample for 90 minutes and on the other sample for 135 minutes;
- Stabilize both samples with 7.5% Portland Cement and 15% Class C Fly Ash*;
- Allow both samples to cure for 21 days;
- Perform Total and SPLP VOC and SVOC analyses on both samples; and
- Perform strength testing on both samples.

* Note: Fly ash is significantly less expensive than lime kiln dust ($25 per ton versus $41 per ton for 35, 000 tons) and appears to afford the same level of treatment.

Table 1
S/S/S Treatability Study
Phase III Testing Results - Comparison of Control Sample and Parent Mixture Testing Results
Summary of Total Volatiles Analyses - EPA Method 8260B
Nease Chemical Site
Salem, Ohio

Results (µg/Kg)	Untreated Material Characterization			Control Testing		Air Stripping and ZVI Testing	
Total Volatiles Analysis	Untreated - A Result	Untreated - B Result	Untreated - C Result	Untreated Control - Day 0 Result	Untreated Control - Day 21 Result	AS Parent Mixture Result	ZVI Parent Mixture Result
Acetone	-	-	-	-	-	-	-
Benzene	51,400	43,900	48,500	3,600	961	46,200	31,500
Bromobenzene	-	-	-	-	-	-	-
Bromochloromethane	-	-	-	-	-	-	-
Bromodichloromethane	-	-	-	-	-	-	-
Bromoform	-	-	-	-	-	-	-
Bromomethane	-	-	-	-	-	-	-
2-Butanone	-	-	-	-	-	-	-
n-Butylbenzene	-	-	-	-	-	-	-
sec-Butylbenzene	-	-	-	-	-	-	-
tert-Butylbenzene	-	-	-	-	-	-	-
Carbon disulfide	-	-	-	-	-	-	-
Carbon tetrachloride		-	-	-	-	6,640	4,370
Chlorobenzene	30,300	29,000	29,500	3,910	-	31,200	20,400
Chlorodibromomethane	-	-	-	-	-	-	-
Chloroethane	-	-	-	-	-	-	-
2-Chloroethyl vinyl ether	-	-	-	-	-	-	-
Chloroform	-	-	-	-	-	-	-
Chloromethane	-	-	-	-	-	-	-
2-Chlorotoluene	-	-	-	-	-	-	-
4-Chlorotoluene	-	-	-	-	-	-	-
1,2-Dibromo-3-chloropropane	-	-	-	-	-	-	-
1,2-Dibromoethane	-	-	-	-	-	-	-
Dibromomethane	-	-	-	-	-	-	-
1,2-Dichlorobenzene	3,880,000	3,410,000	3,330,000	892,000	231,000	3,840,000	2,690,000
1,3-Dichlorobenzene	-	-	-	-	-	-	-
1,4-Dichlorobenzene	29,600	27,500	26,500	6,840	1,580	30,100	19,500
Dichlorodifluoromethane	-	-	-	-	-	-	-
1,1-Dichloroethane	-	-	-	-	-	-	-
1,2-Dichloroethane	-	-	-	-	-	-	-
1,1-Dichloroethene	-	-	-	-	-	-	-
cis-1,2-Dichloroethene	-	-	-	-	-	-	-
trans-1,2-Dichloroethene	-	-	-	-	-	-	-
1,2-Dichloropropane	-	-	-	-	-	-	-
1,3-Dichloropropane	-	-	-	-	-	-	-
2,2-Dichloropropane	-	-	-	-	-	-	-
cis-1,3-Dichloropropene	-	-	-	-	-	-	-
trans-1,3-Dichloropropene	-	-	-	-	-	-	-
1,1-Dichloropropene	-	-	-	-	-	-	-
Ethylbenzene	-	-	-	-	-	10,100	6,250
2-Hexanone	-	-	-	-	-	-	-
Hexachlorobutadiene	-	-	18,600	6,430	1,250	11,900	7,940
Isopropylbenzene	-	-	-	3,650	-	15,000	9,310
p-Isopropyltoluene	-	-	-	-	-	-	-
4-Methyl-2-pentanone	-	-	-	-	-	-	-
Methylene chloride	-	-	-	-	-	-	-
Naphthalene	-	-	-	-	-	132,000	5,520
n-Propylbenzene	-	-	-	-	-	-	-
Styrene	-	-	-	-	-		-
1,1,1,2-Tetrachloroethane	-	-	-	-	-	-	-
1,1,2,2-Tetrachloroethane	241,000	202,000	192,000	22,600	10,100	197,000	126,000
Tetrachloroethene	966,000	874,000	888,000	161,000	18,700	977,000	648,000
Toluene	35,900	31,400	33,400	3,710	-	36,400	23,700
1,2,3-Trichlorobenzene	-	-	-	-	-	-	-
1,2,4-Trichlorobenzene	-	-	-	-	-	-	-
1,1,1-Trichloroethane	-	-	-	-	-	-	-
1,1,2-Trichloroethane	-	-	-	-	-	-	-
Trichloroethene	73,600	59,900	63,600	7,670	1,870	69,800	49,600
Trichlorofluoromethane	-	-	-	-	-	-	-
1,2,3-Trichloropropane	-	-	-	-	-	-	-
1,2,4-Trimethylbenzene	-	-	-	-	-	-	-
1,3,5-Trimethylbenzene	-	-	-	-	-	-	-
Vinyl acetate	-	-	-	-	-	-	-
Vinyl chloride	-	-	-	-	-	-	-
o-Xylene	-	-	-	-	-	7,990	4,750
m, p -Xylene	30,200	26,300	29,700	5,900	-	39,000	24,500
Totals	5,338,000	4,704,000	4,659,800	1,117,310	265,461	5,450,330	3,671,340

Table 1a
S/S/S Treatability Study
Phase III Testing Results - Comparison of Control Sample and Parent Mixture Testing Results
Summary of SPLP Analyses - EPA Method 1312/8260B
Nease Chemical Site
Salem, Ohio

Results (µg/L)	Untreated Material Characterization			Control Testing		Air Stripping and ZVI Testing	
Total Volatiles Analysis	Untreated - A Result	Untreated - B Result	Untreated - C Result	Untreated Control - Day 0 Result	Untreated Control - Day 21 Result	AS Parent Mixture Result	ZVI Parent Mixture Result
Acetone	-	-	-	-	-	-	-
Benzene	3,220	2,400	2,350	492	309	1,410	1,770
Bromobenzene	-	-	-	-	-	-	-
Bromochloromethane	-	-	-	-	-	-	-
Bromodichloromethane	-	-	-	-	-	-	-
Bromoform	-	-	-	-	-	-	-
Bromomethane	-	-	-	-	-	-	-
2-Butanone	-	-	-	-	-	-	-
n-Butylbenzene	-	-	-	-	-	-	-
sec-Butylbenzene	-	-	-	-	-	-	-
tert-Butylbenzene	-	-	-	-	-	-	-
Carbon disulfide	-	-	-	-	-	-	-
Carbon tetrachloride	-	-	-	-	-	-	-
Chlorobenzene	1,380	1,280	1,250	474	380	890	1,090
Chlorodibromomethane	-	-	-	-	-	-	-
Chloroethane	-	-	-	-	-	-	-
2-Chloroethyl vinyl ether	-	-	-	-	-	-	-
Chloroform	67.4	-	-	-	-	-	-
Chloromethane	-	-	-	-	-	-	-
2-Chlorotoluene	-	-	-	-	-	-	-
4-Chlorotoluene	-	-	-	-	-	-	-
,2-Dibromo-3-chloropropane	-	-	-	-	-	-	-
1,2-Dibromoethane	-	-	-	-	-	-	-
Dibromomethane	-	-	-	-	-	-	-
1,2-Dichlorobenzene	80,800	92,300	92,300	56,300	54,000	67,800	69,400
1,3-Dichlorobenzene	-	-	-	-	-	-	-
1,4-Dichlorobenzene	567	659	604	412	411	522	530
Dichlorodifluoromethane	-	-	-	-	-	-	-
1,1-Dichloroethane	-	-	-	-	-	-	-
1,2-Dichloroethane	482	304	286	-	-	166	208
1,1-Dichloroethene	-	-	-	-	-	-	-
cis-1,2-Dichloroethene	-	-	-	-	-	-	-
trans-1,2-Dichloroethene	-	-	-	-	-	-	-
1,2-Dichloropropane	-	-	-	-	-	-	-
1,3-Dichloropropane	-	-	-	-	-	-	-
2,2-Dichloropropane	-	-	-	-	-	-	-
cis-1,3-Dichloropropene	-	-	-	-	-	-	-
trans-1,3-Dichloropropene	-	-	-	-	-	-	-
1,1-Dichloropropene	-	-	-	-	-	-	-
Ethylbenzene	265	273	268	129	-	190	242
2-Hexanone	-	-	-	-	-	-	-
Hexachlorobutadiene	-	-	-	-	-	-	-
Isopropylbenzene	388	397	395	135	152	148	138
p-Isopropyltoluene	-	-	-	-	-	-	-
4-Methyl-2-pentanone	-	-	-	-	-	-	-
Methylene chloride	-	-	-	-	-	-	-
Naphthalene	-	-	-	-	-	-	-
n-Propylbenzene	-	-	-	-	-	-	-
Styrene	-	-	-	-	-	-	-
1,1,1,2-Tetrachloroethane	-	-	-	-	-	-	-
1,1,2,2-Tetrachloroethane	13,000	10,300	10,600	2,540	2,140	6,250	9,010
Tetrachloroethene	27,000	30,600	29,000	15,300	11,900	23,200	24,000
Toluene	1,760	1,570	1,560	474	395	1,020	1,280
1,2,3-Trichlorobenzene	-	-	-	-	-	-	-
1,2,4-Trichlorobenzene	-	-	-	-	-	-	-
1,1,1-Trichloroethane	-	-	-	-	-	-	-
1,1,2-Trichloroethane	-	-	-	-	-	-	-
Trichloroethene	3,610	3,120	3,020	826	721	2,130	2,600
Trichlorofluoromethane	-	-	-	-	-	-	-
1,2,3-Trichloropropane	-	-	-	-	-	-	-
1,2,4-Trimethylbenzene	-	-	-	-	-	-	-
1,3,5-Trimethylbenzene	-	-	-	-	-	-	-
Vinyl acetate	-	-	-	-	-	-	-
Vinyl chloride	-	-	-	-	-	-	-
o-Xylene	161	162	137	-	-	144	161
m, p -Xylene	924	970	955	522	460	783	842

TABLE 2 (Revised)
S/S/S Treatability Study
SOIL SE0190-015: Untreated
AIR STRIPPING: SAMPLING @ 10, 30, 60, 135 MINUTES
Summary of Total Volatiles Analyses - EPA Method 8260B
(Destined for 7.5% Portland Cement, 15% Fly Ash Treatment)
Nease Chemical Site
Salem, Ohio

Parameter	AS Parent Mixture (µg/Kg) 0		AS @ 10 minutes (µg/Kg) 10		AS @ 30 minutes (µg/Kg) 30		AS @ 60 minutes (µg/Kg) 60		AS @ 135 minutes (µg/Kg) 135	
	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL
Acetone	-	50,000	-	50,000	-	50,000	-	50,000	-	34,400
Benzene	46,200	5,000	8,830	5,000	-	5,000	-	5,000	5,650	3,440
Bromobenzene	-	5,000	-	5,000	-	5,000	-	5,000	-	3,440
Bromochloromethane	-	5,000	-	5,000	-	5,000	-	5,000	-	3,440
Bromodichloromethane	-	5,000	-	5,000	-	5,000	-	5,000	-	3,440
Bromoform	-	5,000	-	5,000	-	5,000	-	5,000	-	3,440
Bromomethane	-	10,000	-	10,000	-	10,000	-	10,000	-	6,890
2-Butanone	-	25,000	-	25,000	-	25,000	-	25,000	-	17,200
n-Butylbenzene	-	5,000	-	5,000	-	5,000	-	5,000	-	3,440
sec-Butylbenzene	-	5,000	-	5,000	-	5,000	-	5,000	-	3,440
tert-Butylbenzene	-	5,000	-	5,000	-	5,000	-	5,000	-	3,440
Carbon disulfide	-	5,000	-	5,000	-	5,000	-	5,000	-	3,440
Carbon tetrachloride	6,640	5,000	-	5,000	-	5,000	-	5,000	-	3,440
Chlorobenzene	31,200	5,000	12,100	5,000	9,010	5,000	-	5,000	-	3,440
Chlorodibromomethane	-	5,000	-	5,000	-	5,000	-	5,000	-	3,440
Chloroethane	-	10,000	-	10,000	-	10,000	-	10,000	-	6,890
2-Chloroethyl vinyl ether	-	20,000	-	20,000	-	20,000	-	20,000	-	13,800
Chloroform	-	5,000	-	5,000	-	5,000	-	5,000	-	3,440
Chloromethane	-	20,000	-	20,000	-	20,000	-	20,000	-	13,800
2-Chlorotoluene	-	5,000	-	5,000	-	5,000	-	5,000	-	3,440
4-Chlorotoluene	-	5,000	-	5,000	-	5,000	-	5,000	-	3,440
1,2-Dibromo-3-chloropropane	-	20,000	-	20,000	-	20,000	-	20,000	-	13,800
1,2-Dibromoethane	-	5,000	-	5,000	-	5,000	-	5,000	-	3,440
Dibromomethane	-	5,000	-	5,000	-	5,000	-	5,000	-	3,440
1,2-Dichlorobenzene	3,840,000	12,500	1,970,000	5,000	1,680,000	25,000	1,860,000	5,000	690,000	3,440
1,3-Dichlorobenzene	-	5,000	-	5,000	-	5,000	-	5,000	-	3,440
1,4-Dichlorobenzene	30,100	5,000	15,800	5,000	15,800	5,000	13,400	5,000	5,090	3,440
Dichlorodifluoromethane	-	10,000	-	10,000	-	10,000	-	10,000	-	6,890
1,1-Dichloroethane	-	10,000	-	10,000	-	10,000	-	10,000	-	6,890
1,2-Dichloroethane	-	5,000	-	5,000	-	5,000	-	5,000	-	3,440
1,1-Dichloroethene	-	5,000	-	5,000	-	5,000	-	5,000	-	3,440
cis-1,2-Dichloroethene	-	5,000	-	5,000	-	5,000	-	5,000	-	3,440
trans-1,2-Dichloroethene	-	5,000	-	5,000	-	5,000	-	5,000	-	3,440
1,2-Dichloropropane	-	5,000	-	5,000	-	5,000	-	5,000	-	3,440
1,3-Dichloropropane	-	5,000	-	5,000	-	5,000	-	5,000	-	3,440
2,2-Dichloropropane	-	5,000	-	5,000	-	5,000	-	5,000	-	3,440
cis-1,3-Dichloropropene	-	5,000	-	5,000	-	5,000	-	5,000	-	3,440
trans-1,3-Dichloropropene	-	5,000	-	5,000	-	5,000	-	5,000	-	3,440
1,1-Dichloropropene	-	5,000	-	5,000	-	5,000	-	5,000	-	3,440
Ethylbenzene	10,100	5,000	-	5,000	-	5,000	-	5,000	-	3,440
2-Hexanone	-	2,500	-	25,000	-	25,000	-	25,000	-	17,200
Hexachlorobutadiene	11,900	5,000	8,850	5,000	9,200	5,000	10,100	5,000	5,930	3,440
Isopropylbenzene	15,000	5,000	8,120	5,000	7,190	5,000	5,890	5,000	-	3,440
p-Isopropyltoluene	-	5,000	-	5,000	-	5,000	-	5,000	-	3,440
4-Methyl-2-pentanone	-	2,500	-	25,000	-	25,000	-	25,000	-	17,200
Methylene chloride	-	10,000	-	10,000	-	10,000	-	10,000	-	6,890
Naphthalene	132,000	5,000	-	5,000	-	5,000	-	5,000	-	3,440
n-Propylbenzene	-	5,000	-	5,000	-	5,000	-	5,000	-	3,440
Styrene	-	5,000	-	5,000	-	5,000	-	5,000	-	3,440
1,1,1,2-Tetrachloroethane	-	5,000	-	5,000	-	5,000	-	5,000	-	3,440
1,1,2,2-Tetrachloroethane	197,000	5,000	73,900	5,000	71,400	5,000	47,200	5,000	35,000	3,440
Tetrachloroethene	977,000	5,000	427,000	5,000	324,000	5,000	181,000	5,000	85,000	3,440
Toluene	36,400	5,000	11,800	5,000	7,390	5,000	-	5,000	-	3,440
1,2,3-Trichlorobenzene	-	5,000	-	5,000	-	5,000	-	5,000	-	3,440
1,2,4-Trichlorobenzene	-	5,000	-	5,000	-	5,000	-	5,000	-	3,440
1,1,1-Trichloroethane	-	5,000	-	5,000	-	5,000	-	5,000	-	3,440
1,1,2-Trichloroethane	-	5,000	-	5,000	-	5,000	-	5,000	-	3,440
Trichloroethene	69,800	5,000	24,100	5,000	9,890	10,000	6,580	5,000	10,700	3,440
Trichlorofluoromethane	-	10,000	-	10,000	-	10,000	-	10,000	-	6,890
1,2,3-Trichloropropane	-	5,000	-	10,000	-	5,000	-	10,000	-	6,890
1,2,4-Trimethylbenzene	-	5,000	-	5,000	-	5,000	-	5,000	-	3,440
1,3,5-Trimethylbenzene	-	5,000	-	5,000	-	5,000	-	5,000	-	3,440
Vinyl acetate	-	10,000	-	10,000	-	10,000	-	10,000	-	6,890
Vinyl chloride	-	10,000	-	10,000	-	10,000	-	10,000	-	6,890
o-Xylene	7,990	5,000	-	5,000	-	5,000	-	5,000	-	3,440
m, p -Xylene	39,000	5,000	15,700	5,000	12,300	5,000	6,730	5,000	-	3,440
	(µg/Kg)		(µg/Kg)	Percent Removal	(µg/Kg)	Percent Removal	(µg/Kg)	Percent Removal	(µg/Kg)	Percent Removal
Total VOCs	5,450,330		2,576,200		2,146,180		2,130,900		837,370	
Total Percent Removal				52.7%		60.6%		60.9%		84.6%
Rate of Removal Over Time (% Removal/Minute)				5%		2%		1%		1%

Note: From Draft Kemron Table 9

TABLE 3 (Revised)
S/S/S Treatability Study
SOIL SE0190-016: Untreated
AIR STRIPPING: SAMPLING @ 10, 30, 60, 135 MINUTES
Summary of Total Volatiles Analyses - EPA Method 8260B
(Destined for 7.5% Portland Cement, 15% Lime Kiln Dust Teatment)
Nease Chemical Site
Salem, Ohio

	AS Parent Mixture (µg/Kg)		AS @ 10 minutes (µg/Kg)		AS @ 30 minutes (µg/Kg)		AS @ 60 minutes (µg/Kg)		AS @ 135 minutes (µg/Kg)	
	0		10		30		60		135	
	Result	DL	Result	DL	Result	DL	Result	DL	Result	DL
Acetone	-	50,000	-	50,000	-	50,000	-	50,000	-	21,400
Benzene	46,200	5,000	13,600	5,000	-	5,000	-	5,000	-	2,140
Bromobenzene	-	5,000	-	5,000	-	5,000	-	5,000	-	2,140
Bromochloromethane	-	5,000	-	5,000	-	5,000	-	5,000	-	2,140
Bromodichloromethane	-	5,000	-	5,000	-	5,000	-	5,000	-	2,140
Bromoform	-	5,000	-	5,000	-	5,000	-	5,000	-	2,140
Bromomethane	-	10,000	-	10,000	-	10,000	-	10,000	-	4,270
2-Butanone	-	25,000	-	25,000	-	25,000	-	25,000	-	10,700
n-Butylbenzene	-	5,000	-	5,000	-	5,000	-	5,000	-	2,140
sec-Butylbenzene	-	5,000	-	5,000	-	5,000	-	5,000	-	2,140
tert-Butylbenzene	-	5,000	-	5,000	-	5,000	-	5,000	-	2,140
Carbon disulfide	-	5,000	-	5,000	-	5,000	-	5,000	-	2,140
Carbon tetrachloride	6,640	5,000	-	5,000	-	5,000	-	5,000	-	2,140
Chlorobenzene	31,200	5,000	17,900	5,000	9,570	5,000	-	5,000	-	2,140
Chlorodibromomethane	-	5,000	-	5,000	-	5,000	-	5,000	-	2,140
Chloroethane	-	10,000	-	10,000	-	10,000	-	10,000	-	4,270
2-Chloroethyl vinyl ether	-	20,000	-	20,000	-	20,000	-	20,000	-	8,550
Chloroform	-	5,000	-	5,000	-	5,000	-	5,000	-	2,140
Chloromethane	-	20,000	-	20,000	-	20,000	-	20,000	-	8,550
2-Chlorotoluene	-	5,000	-	5,000	-	5,000	-	5,000	-	2,140
4-Chlorotoluene	-	5,000	-	5,000	-	5,000	-	5,000	-	2,140
1,2-Dibromo-3-chloropropane	-	20,000	-	20,000	-	20,000	-	20,000	-	8,550
1,2-Dibromoethane	-	5,000	-	5,000	-	5,000	-	5,000	-	2,140
Dibromomethane	-	5,000	-	5,000	-	5,000	-	5,000	-	2,140
1,2-Dichlorobenzene	3,840,000	12,500	3,490,000	25,000	2,700,000	25,000	1,740,000	5,000	544,000	2,140
1,3-Dichlorobenzene	-	5,000	-	5,000	-	5,000	-	5,000	-	2,140
1,4-Dichlorobenzene	30,100	5,000	22,100	5,000	17,700	5,000	12,300	5,000	3,500	2,140
Dichlorodifluoromethane	-	10,000	-	10,000	-	10,000	-	10,000	-	4,270
1,1-Dichloroethane	-	10,000	-	10,000	-	10,000	-	10,000	-	4,270
1,2-Dichloroethane	-	5,000	-	5,000	-	5,000	-	5,000	-	2,140
1,1-Dichloroethene	-	5,000	-	5,000	-	5,000	-	5,000	-	2,140
cis-1,2-Dichloroethene	-	5,000	-	5,000	-	5,000	-	5,000	-	2,140
trans-1,2-Dichloroethene	-	5,000	-	5,000	-	5,000	-	5,000	-	2,140
1,2-Dichloropropane	-	5,000	-	5,000	-	5,000	-	5,000	-	2,140
1,3-Dichloropropane	-	5,000	-	5,000	-	5,000	-	5,000	-	2,140
2,2-Dichloropropane	-	5,000	-	5,000	-	5,000	-	5,000	-	2,140
cis-1,3-Dichloropropene	-	5,000	-	5,000	-	5,000	-	5,000	-	2,140
trans-1,3-Dichloropropene	-	5,000	-	5,000	-	5,000	-	5,000	-	2,140
1,1-Dichloropropene	-	5,000	-	5,000	-	5,000	-	5,000	-	2,140
Ethylbenzene	10,100	5,000	5,090	5,000	-	5,000	-	5,000	-	2,140
2-Hexanone	-	2,500	-	25,000	-	25,000	-	25,000	-	10,700
Hexachlorobutadiene	11,900	5,000	10,500	5,000	10,600	5,000	9,030	5,000	5,570	2,140
Isopropylbenzene	15,000	5,000	9,390	5,000	7,340	5,000	5,280	5,000	-	2,140
p-Isopropyltoluene	-	5,000	-	5,000	-	5,000	-	5,000	-	2,140
4-Methyl-2-pentanone	-	2,500	-	25,000	-	25,000	-	25,000	-	10,700
Methylene chloride	-	10,000	-	10,000	-	10,000	-	10,000	-	4,270
Naphthalene	132,000	5,000	-	5,000	-	5,000	-	5,000	-	2,140
n-Propylbenzene	-	5,000	-	5,000	-	5,000	-	5,000	-	2,140
Styrene		5,000	-	5,000	-	5,000	-	5,000	-	2,140
1,1,1,2-Tetrachloroethane	-	5,000	-	5,000	-	5,000	-	5,000	-	2,140
1,1,2,2-Tetrachloroethane	197,000	5,000	133,000	5,000	87,800	5,000	43,200	5,000	15,300	2,140
Tetrachloroethene	977,000	5,000	590,000	5,000	330,000	5,000	135,000	5,000	33,000	2,140
Toluene	36,400	5,000	17,300	5,000	7,220	5,000	-	5,000	-	2,140
1,2,3-Trichlorobenzene	-	5,000	-	5,000	-	5,000	-	5,000	-	2,140
1,2,4-Trichlorobenzene	-	5,000	-	5,000	-	5,000	-	5,000	-	2,140
1,1,1-Trichloroethane	-	5,000	-	5,000	-	5,000	-	5,000	-	2,140
1,1,2-Trichloroethane	-	5,000	-	5,000	-	5,000	-	5,000	-	2,140
Trichloroethene	69,800	5,000	25,700	5,000	10,600	5,000	-	5,000	3,410	2,140
Trichlorofluoromethane	-	10,000	-	10,000	-	10,000	-	10,000	-	4,270
1,2,3-Trichloropropane	-	5,000	-	10,000	-	10,000	-	10,000	-	4,270
1,2,4-Trimethylbenzene	-	5,000	-	5,000	-	5,000	-	5,000	-	2,140
1,3,5-Trimethylbenzene	-	5,000	-	5,000	-	5,000	-	5,000	-	2,140
Vinyl acetate	-	10,000	-	10,000	-	10,000	-	10,000	-	4,270
Vinyl chloride	-	10,000	-	10,000	-	10,000	-	10,000	-	4,270
o-Xylene	7,990	5,000	-	5,000	-	5,000	-	5,000	-	2,140
m, p -Xylene	39,000	5,000	21,300	5,000	12,700	5,000	5,370	5,000	-	2,140
	(µg/Kg)		(µg/Kg)	Percent Removal	(µg/Kg)	Percent Removal	(µg/Kg)	Percent Removal	(µg/Kg)	Percent Removal
Total VOCs	5,450,330		4,355,880		3,193,530		1,950,180		604,780	
Total Percent Removal				20.1%		41.4%		64.2%		88.9%
Rate of Removal Over Time (% Removal/Minute)				2%		1%		1%		1%

Note: From Draft Kemron Table 10

Table 4 (Revised)
S/S/S Treatability Study
Phase III VOC Confirmation Testing Results
Summary of Total Volatiles Analyses - EPA Method 8260B
Nease Chemical Site
Salem, Ohio

TOTAL VOLATILES	AIR STRIPPING: 21 Day Cure								ZERO VALENT IRON: 21 Day Cure							
	Air Stripping[1] Control (µg/Kg)		Cement & Flyash[2] 0190-15 AS (µg/Kg)		Percent Removal	Cement & Lime Kiln Dust[2] 0190-016 AS (µg/Kg)		Percent Removal	Zero Valent Iron[1] Control (µg/Kg)		Cement & Flyash[2] 0190-017 ZVI (µg/Kg)		Percent Removal	Cement & Lime Kiln Dust[2] 0190-018 ZVI (µg/Kg)		Percent Removal
	Result	DL	Result	DL	%	Result	DL	%	Result	DL	Result	DL	%	Result	DL	%
Acetone	25,000	50,000	1,260	2,520	95%	690	1,380	97%	16,500	33,000	2,510	5,020	85%	1,470	2,940	91%
Benzene	46,200	5,000	497	252	99%	311	138	99%	31,500	3,300	251	502	99%	147	294	100%
Bromobenzene	2,500	5,000	126	252	95%	69	138	97%	1,650	3,300	251	502	85%	147	294	91%
Bromochloromethane	2,500	5,000	126	252	95%	69	138	97%	1,650	3,300	251	502	85%	147	294	91%
Bromodichloromethane	2,500	5,000	126	252	95%	69	138	97%	1,650	3,300	251	502	85%	147	294	91%
Bromoform	2,500	5,000	126	252	95%	69	138	97%	1,650	3,300	251	502	85%	147	294	91%
Bromomethane	5,000	10,000	252	504	95%	138	276	97%	3,300	6,600	500	1,000	85%	294	587	91%
2-Butanone	12,500	25,000	630	1,260	95%	345	690	97%	8,250	16,500	1,255	2,510	85%	735	1,470	91%
n-Butylbenzene	2,500	5,000	126	252	95%	69	138	97%	1,650	3,300	251	502	85%	147	294	91%
sec-Butylbenzene	2,500	5,000	126	252	95%	69	138	97%	1,650	3,300	251	502	85%	147	294	91%
tert-Butylbenzene	2,500	5,000	126	252	95%	69	138	97%	1,650	3,300	251	502	85%	147	294	91%
Carbon disulfide	2,500	5,000	126	252	95%	69	138	97%	1,650	3,300	251	502	85%	147	294	91%
Carbon tetrachloride	6,640	5,000	126	252	98%	69	138	99%	4,370	3,300	251	502	94%	147	294	97%
Chlorobenzene	31,200	5,000	287	252	99%	183	138	99%	20,400	3,300	251	502	99%	147	294	99%
Chlorodibromomethane	2,500	5,000	126	252	95%	69	138	97%	1,650	3,300	251	502	85%	147	294	91%
Chloroethane	5,000	10,000	252	504	95%	138	276	97%	3,300	6,600	500	1,000	85%	294	587	91%
2-Chloroethyl vinyl ether	10,000	20,000	505	1,010	95%	276	552	97%	6,600	13,200	1,005	2,010	85%	585	1,170	91%
Chloroform	2,500	5,000	126	252	95%	69	138	97%	1,650	3,300	251	502	85%	147	294	91%
Chloromethane	10,000	20,000	505	1,010	95%	276	552	97%	6,600	13,200	1,005	2,010	85%	585	1,170	91%
2-Chlorotoluene	2,500	5,000	126	252	95%	69	138	97%	1,650	3,300	251	502	85%	147	294	91%
4-Chlorotoluene	2,500	5,000	126	252	95%	69	138	97%	1,650	3,300	251	502	85%	147	294	91%
1,2-Dibromo-3-chloropropane	10,000	20,000	505	1,010	95%	276	552	97%	6,600	13,200	1,005	2,010	85%	585	1,170	91%
1,2-Dibromoethane	2,500	5,000	126	252	95%	69	138	97%	1,650	3,300	251	502	85%	147	294	91%
Dibromomethane	2,500	5,000	126	252	95%	69	138	97%	1,650	3,300	251	502	85%	147	294	91%
1,2-Dichlorobenzene	3,840,000	12,500	75,800	252	98%	48,700	138	99%	2,690,000	8,250	114,000	502	96%	56,500	294	98%
1,3-Dichlorobenzene	2,500	5,000	126	252	95%	69	138	97%	1,650	3,300	251	502	85%	147	294	91%
1,4-Dichlorobenzene	30,100	5,000	612	252	98%	374	138	99%	19,500	3,300	934	502	95%	432	294	98%
Dichlorodifluoromethane	5,000	10,000	252	504	95%	138	276	97%	3,300	6,600	500	1,000	85%	294	587	91%
1,1-Dichloroethane	5,000	10,000	252	504	95%	138	276	97%	3,300	6,600	500	1,000	85%	294	587	91%
1,2-Dichloroethane	2,500	5,000	126	252	95%	139	138	94%	1,650	3,300	251	502	85%	147	294	91%
1,1-Dichloroethene	2,500	5,000	126	252	95%	69	138	97%	1,650	3,300	251	502	85%	147	294	91%
cis-1,2-Dichloroethene	2,500	5,000	126	252	95%	69	138	97%	1,650	3,300	251	502	85%	147	294	91%
trans-1,2-Dichloroethene	2,500	5,000	126	252	95%	69	138	97%	1,650	3,300	251	502	85%	147	294	91%
1,2-Dichloropropane	2,500	5,000	126	252	95%	69	138	97%	1,650	3,300	251	502	85%	147	294	91%
1,3-Dichloropropane	2,500	5,000	126	252	95%	69	138	97%	1,650	3,300	251	502	85%	147	294	91%
2,2-Dichloropropane	2,500	5,000	126	252	95%	69	138	97%	1,650	3,300	251	502	85%	147	294	91%
cis-1,3-Dichloropropene	2,500	5,000	126	252	95%	69	138	97%	1,650	3,300	251	502	85%	147	294	91%
trans-1,3-Dichloropropene	2,500	5,000	126	252	95%	69	138	97%	1,650	3,300	251	502	85%	147	294	91%
1,1-Dichloropropene	2,500	5,000	126	252	95%	69	138	97%	1,650	3,300	251	502	85%	147	294	91%
Ethylbenzene	10,100	5,000	126	252	99%	69	138	99%	6,250	3,300	251	502	96%	147	294	98%
2-Hexanone	1,250	2,500	630	1,260	50%	345	690	72%	8,250	16,500	1,255	2,510	85%	735	1,470	91%
Hexachlorobutadiene	11,900	5,000	1,160	252	90%	1,220	138	90%	7,940	3,300	930	502	88%	769	294	90%
Isopropylbenzene	15,000	5,000	126	252	99%	69	138	100%	9,310	3,300	251	502	97%	147	294	98%
p-Isopropyltoluene	2,500	5,000	126	252	95%	69	138	97%	1,650	3,300	251	502	85%	147	294	91%
4-Methyl-2-pentanone	1,250	2,500	630	1,260	50%	345	690	72%	8,250	16,500	1,255	2,510	85%	735	1,470	91%
Methylene chloride	5,000	10,000	252	504	95%	138	276	97%	3,300	6,600	500	1,000	85%	294	587	91%
Naphthalene	132,000	5,000	126	252	100%	69	138	100%	5,520	3,300	251	502	95%	147	294	97%
n-Propylbenzene	2,500	5,000	126	252	95%	69	138	97%	1,650	3,300	251	502	85%	147	294	91%
Styrene	2,500	5,000	126	252	95%	151	138	94%	1,650	3,300	251	502	85%	147	294	91%
1,1,1,2-Tetrachloroethane	2,500	5,000	126	252	95%	69	138	97%	1,650	3,300	251	502	85%	147	294	91%
1,1,2,2-Tetrachloroethane	197,000	5,000	126	252	100%	69	138	100%	126,000	3,300	251	502	100%	147	294	100%
Tetrachloroethene	977,000	5,000	10,400	252	99%	6,230	138	99%	648,000	3,300	16,800	502	97%	6,140	294	99%
Toluene	36,400	5,000	291	252	99%	159	138	100%	23,700	3,300	251	502	99%	147	294	99%
1,2,3-Trichlorobenzene	2,500	5,000	126	252	95%	69	138	97%	1,650	3,300	251	502	85%	147	294	91%
1,2,4-Trichlorobenzene	2,500	5,000	126	252	95%	172	138	93%	1,650	3,300	251	502	85%	147	294	91%
1,1,1-Trichloroethane	2,500	5,000	126	252	95%	69	138	97%	1,650	3,300	251	502	85%	147	294	91%
1,1,2-Trichloroethane	2,500	5,000	126	252	95%	69	138	97%	1,650	3,300	251	502	85%	147	294	91%
Trichloroethene	69,800	5,000	3,730	252	95%	1,690	138	98%	49,600	3,300	2,150	502	96%	1,330	294	97%
Trichlorofluoromethane	5,000	10,000	252	504	95%	138	276	97%	3,300	6,600	500	1,000	85%	294	587	91%
1,2,3-Trichloropropane	2,500	5,000	252	504	90%	138	276	94%	3,300	6,600	500	1,000	85%	294	587	91%
1,2,4-Trimethylbenzene	2,500	5,000	126	252	95%	69	138	97%	1,650	3,300	251	502	85%	147	294	91%
1,3,5-Trimethylbenzene	2,500	5,000	126	252	95%	69	138	97%	1,650	3,300	251	502	85%	147	294	91%
Vinyl acetate	5,000	10,000	252	504	95%	138	276	97%	3,300	6,600	500	1,000	85%	294	587	91%
Vinyl chloride	5,000	10,000	252	504	95%	138	276	97%	3,300	6,600	500	1,000	85%	294	587	91%
o-Xylene	7,990	5,000	126	252	98%	69	138	99%	4,750	3,300	251	502	95%	147	294	97%
m, p -Xylene	39,000	5,000	126	252	100%	145	138	100%	24,500	3,300	519	502	98%	147	294	99%
	5,650,330		105,002		98%	65,891	14,490	99%	3,819,840		160,167		97%	79,858	30,843	99%

Notes:

1 Air Stripping Control laboratory results from draft Kemron Table 8.

2 Cement & Flyash and Cement & Lime Kiln Dust laboratory results from draft Kemron Table 13.

3 Red results denote non-detects that are listed as 1/2 the reporting limit (i.e.,126)

Table 4a (Revised)
S/S/S Treatability Study
Phase III SPLP Confirmation Testing Results
Summary of SPLP Analyses - EPA Method 1312/8260B
Nease Chemical Site
Salem, Ohio

	AIR STRIPPING: 21 Day Cure								ZERO VALENT IRON: 21 Day Cure							
	Air Stripping[1] Control (µg/Kg)		Cement & Flyash[2] 0190-15 AS (µg/Kg)		Percent Removal	Cement & Lime Kiln Dust[2] 0190-016 AS (µg/Kg)		Percent Removal	Zero Valent Iron[1] Control (µg/Kg)		Cement & Flyash[2] 0190-017 ZVI (µg/Kg)		Percent Removal	Cement & Lime Kiln Dust[2] 0190-018 ZVI (µg/Kg)		Percent Removal
SPLP VOLATILES	Result	DL	Result	DL	%	Result	DL	%	Result	DL	Result	DL	%	Result	DL	%
Acetone	625	1,250	130	125	79%	25	50	96%	625	1,250	250	500	60%	250	500	60%
Benzene	1,410	62.5	3	6.3	100%	8.61	2.5	99%	1,770	62.5	13	25	99%	13	25	99%
Bromobenzene	31	62.5	3	6.3	90%	1	2.5	96%	31	62.5	13	25	60%	13	25	60%
Bromochloromethane	50	100	5	10	90%	2	4	96%	50	100	20	40	60%	20	40	60%
Bromodichloromethane	63	125	6	12.5	90%	3	5	96%	63	125	25	50	60%	25	50	60%
Bromoform	125	250	13	25	90%	5	10	96%	125	250	50	100	60%	50	100	60%
Bromomethane	125	250	13	25	90%	5	10	96%	125	250	50	100	60%	50	100	60%
2-Butanone	625	1,250	63	125	90%	25	50	96%	625	1,250	250	500	60%	250	500	60%
n-Butylbenzene	63	125	6	12.5	90%	3	5	96%	63	125	25	50	60%	25	50	60%
sec-Butylbenzene	63	125	6	12.5	90%	3	5	96%	63	125	25	50	60%	25	50	60%
tert-Butylbenzene	63	125	6	12.5	90%	3	5	96%	63	125	25	50	60%	25	50	60%
Carbon disulfide	125	250	13	25	90%	5	10	96%	125	250	50	100	60%	50	100	60%
Carbon tetrachloride	63	125	6	12.5	90%	3	5	96%	63	125	25	50	60%	25	50	60%
Chlorobenzene	890	62.5	3	6.3	100%	6.57	2.5	99%	1,090	62.5	62.1	25	94%	46.8	25	96%
Chlorodibromomethane	63	125	6	12.5	90%	3	5	96%	63	125	25	50	60%	25	50	60%
Chloroethane	125	250	13	25	90%	5	10	96%	125	250	50	100	60%	50	100	60%
2-Chloroethyl vinyl ether	2,500	5,000	250	500	90%	100	200	96%	2,500	5,000	1,000	2000	60%	1,000	2000	60%
Chloroform	31	62.5	3	6.3	90%	1	2.5	96%	31	62.5	13	25	60%	13	25	60%
Chloromethane	63	125	6	12.5	90%	3	5	96%	63	125	25	50	60%	25	50	60%
2-Chlorotoluene	31	62.5	3	6.3	90%	1	2.5	96%	31	62.5	13	25	60%	13	25	60%
4-Chlorotoluene	63	125	6	12.5	90%	3	5	96%	63	125	25	50	60%	25	50	60%
1,2-Dibromo-3-chloropropane	250	500	25	50	90%	10	20	96%	250	500	100	200	60%	100	200	60%
1,2-Dibromoethane	63	125	6	12.5	90%	3	5	96%	63	125	25	50	60%	25	50	60%
Dibromomethane	63	125	6	12.5	90%	3	5	96%	63	125	25	50	60%	25	50	60%
1,2-Dichlorobenzene	67,800	62.5	4,090	6.3	94%	3,360	2.5	95%	69,400	62.5	30,400	25	56%	33,900	25	51%
1,3-Dichlorobenzene	63	125	6	12.5	90%	3	5	96%	63	125	25	50	60%	25	50	60%
1,4-Dichlorobenzene	522	62.5	20.7	6.3	96%	19.3	2.5	96%	530	62.5	202	25	62%	230	25	57%
Dichlorodifluoromethane	63	125	6	12.5	90%	3	5	96%	63	125	25	50	60%	25	50	60%
1,1-Dichloroethane	31	62.5	3	6.3	90%	1	2.5	96%	31	62.5	13	25	60%	13	25	60%
1,2-Dichloroethane	166	125	6	12.5	96%	5.07	5	97%	208	125	25	50	88%	25	50	88%
1,1-Dichloroethene	125	250	13	25	90%	5	10	96%	125	250	50	100	60%	50	100	60%
cis-1,2-Dichloroethene	63	125	6	12.5	90%	3	5	96%	63	125	25	50	60%	25	50	60%
trans-1,2-Dichloroethene	63	125	6	12.5	90%	3	5	96%	63	125	25	50	60%	25	50	60%
1,2-Dichloropropane	50	100	5	10	90%	2	4	96%	50	100	20	40	60%	20	40	60%
1,3-Dichloropropane	50	100	5	10	90%	2	4	96%	50	100	20	40	60%	20	40	60%
2,2-Dichloropropane	63	125	6	12.5	90%	3	5	96%	63	125	25	50	60%	25	50	60%
cis-1,3-Dichloropropene	63	125	6	12.5	90%	3	5	96%	63	125	25	50	60%	25	50	60%
trans-1,3-Dichloropropene	125	250	13	25	90%	5	10	96%	125	250	50	100	60%	50	100	60%
1,1-Dichloropropene	63	125	6	12.5	90%	3	5	96%	63	125	25	50	60%	25	50	60%
Ethylbenzene	190	125	6	12.5	97%	3	5	99%	242	125	25	50	90%	25	50	90%
2-Hexanone	625	1,250	63	125	90%	25	50	96%	625	1,250	250	500	60%	250	500	60%
Hexachlorobutadiene	63	125	6	12.5	90%	14.5	5	77%	63	125	25	50	60%	25	50	60%
Isopropylbenzene	148	125	6	12.5	96%	3	5	98%	138	125	56.4	50	59%	59.3	50	57%
p-Isopropyltoluene	63	125	6	12.5	90%	3	5	96%	63	125	25	50	60%	25	50	60%
4-Methyl-2-pentanone	625	1,250	63	125	90%	25	50	96%	625	1,250	250	500	60%	250	500	60%
Methylene chloride	63	125	6	12.5	90%	3	5	96%	63	125	25	50	60%	25	50	60%
Naphthalene	50	100	5	10	90%	5.42	4	89%	50	100	20	40	60%	20	40	60%
n-Propylbenzene	31	62.5	3	6.3	90%	1	2.5	96%	31	62.5	13	25	60%	13	25	60%
Styrene	31	62.5	3	6.3	90%	1	2.5	96%	31	62.5	13	25	60%	13	25	60%
1,1,1,2-Tetrachloroethane	63	125	6	12.5	90%	3	5	96%	63	125	25	50	60%	25	50	60%
1,1,2,2-Tetrachloroethane	6,250	62.5	3	6.3	100%	1	2.5	100%	9,010	62.5	13	25	100%	13	25	100%
Tetrachloroethene	23,200	125	74.9	12.5	100%	128	5	99%	24,000	125	2,220	50	91%	1,700	50	93%
Toluene	1,020	125	6	12.5	99%	5.45	5	99%	1,280	125	25	50	98%	25	50	98%
1,2,3-Trichlorobenzene	31	62.5	3	6.3	90%	1	2.5	96%	31	62.5	13	25	60%	13	25	60%
1,2,4-Trichlorobenzene	50	100	5	10	90%	7.96	4	84%	50	100	20	40	60%	20	40	60%
1,1,1-Trichloroethane	63	125	6	12.5	90%	3	5	96%	63	125	25	50	60%	25	50	60%
1,1,2-Trichloroethane	63	125	6	12.5	90%	3	5	96%	63	125	25	50	60%	25	50	60%
Trichloroethene	2,130	125	19.8	12.5	99%	40.8	5	98%	2,600	125	76.1	50	97%	25	50	99%
Trichlorofluoromethane	63	125	6	12.5	90%	3	5	96%	63	125	25	50	60%	25	50	60%
1,2,3-Trichloropropane	125	250	13	25	90%	5	10	96%	125	250	50	100	60%	50	100	60%
1,2,4-Trimethylbenzene	63	125	6	12.5	90%	3	5	96%	63	125	25	50	60%	25	50	60%
1,3,5-Trimethylbenzene	63	125	6	12.5	90%	3	5	96%	63	125	25	50	60%	25	50	60%
Vinyl acetate	625	1,250	63	125	90%	25	50	96%	625	1,250	250	500	60%	250	500	60%
Vinyl chloride	63	125	6	12.5	90%	3	5	96%	63	125	25	50	60%	25	50	60%
o-Xylene	144	125	6	12.5	96%	3	5	98%	161	125	25	50	84%	25	50	84%
m, p -Xylene	783	125	6	12.5	99%	3	5	100%	842	125	115	50	86%	109	50	87%
	113,559		5,210		95%	3,963		97%	120,177		36,819		69%	39,758		67%

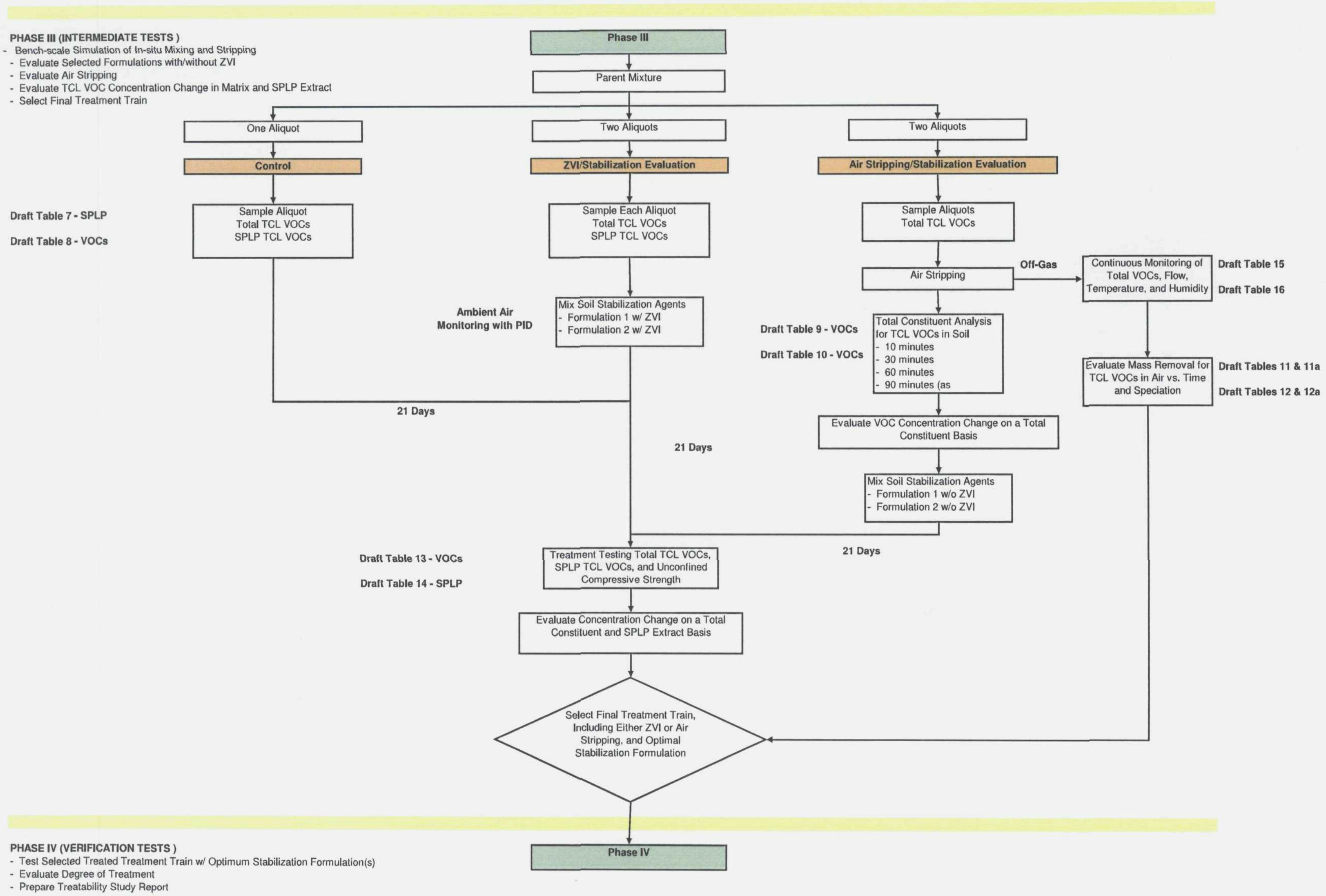
Notes:

1 Air Stripping Control laboratory results from draft Kemron Table 7.

2 Cement & Flyash and Cement & Lime Kiln Dust laboratory results from draft Kemron Table 14.

3 Red results denote non-detects that are listed as 1/2 the reporting limit (i.e., 126)

Figure 1 (Revised)
Rutgers-Salem S/S/S Treatability Study
Phase III Intermediate Tests



Note:
Draft Tables are from forthcoming treatability study report.

From Figure 7 - Rutgers-Salem PDI Work Plan

Golder Associates

Figure 2
Nease Chemical Site - S/S/S Treatability Study
Phase III Air Stripping - Sample SE0190-015
PID Results in Air and Total VOC Results in Soil Over Time

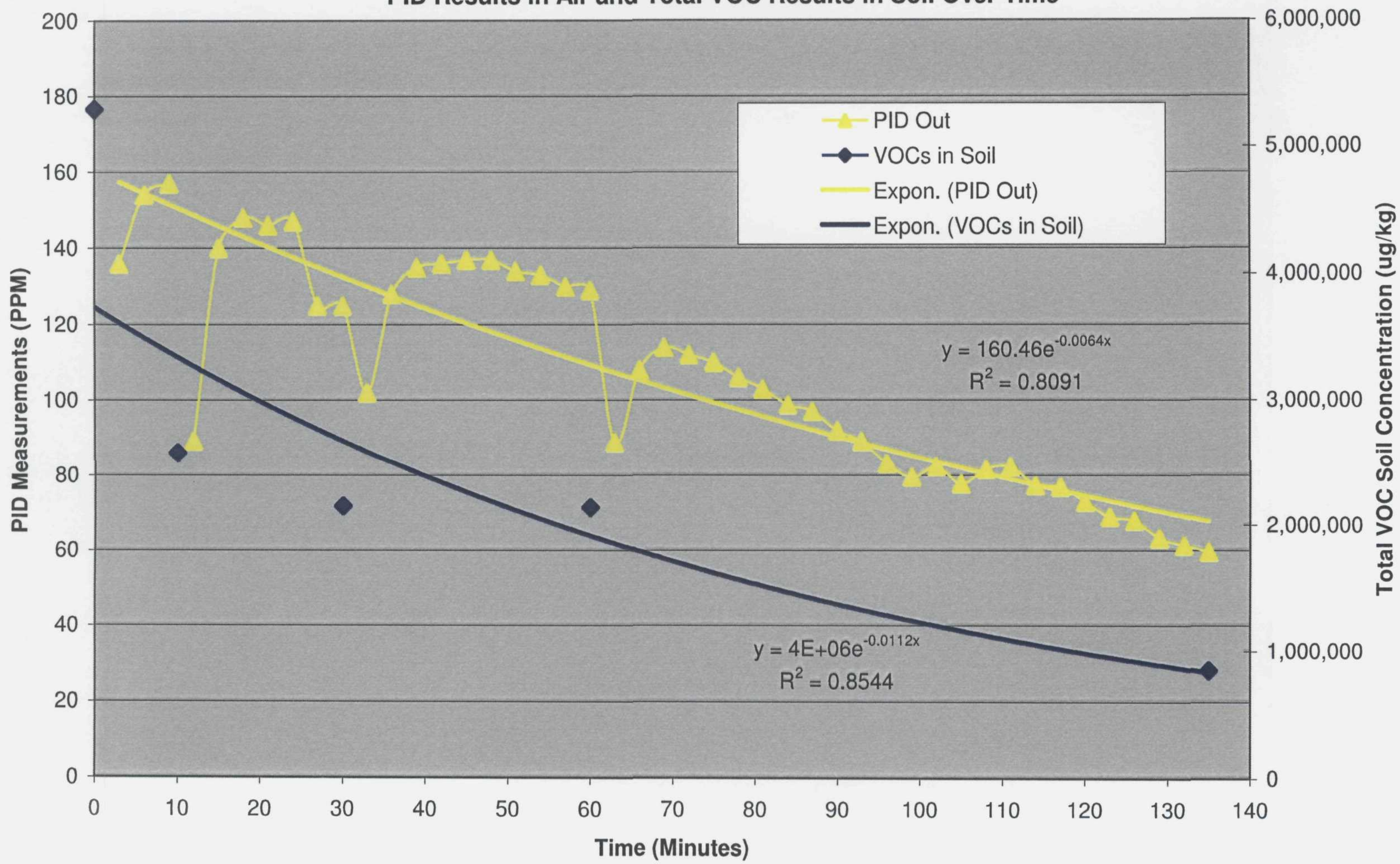


Figure 3
Nease Chemical Site - S/S/S Treatability Study
Phase III Air Stripping - Sample SE0190-016
PID Results and Total VOC Results in Soil Over Time

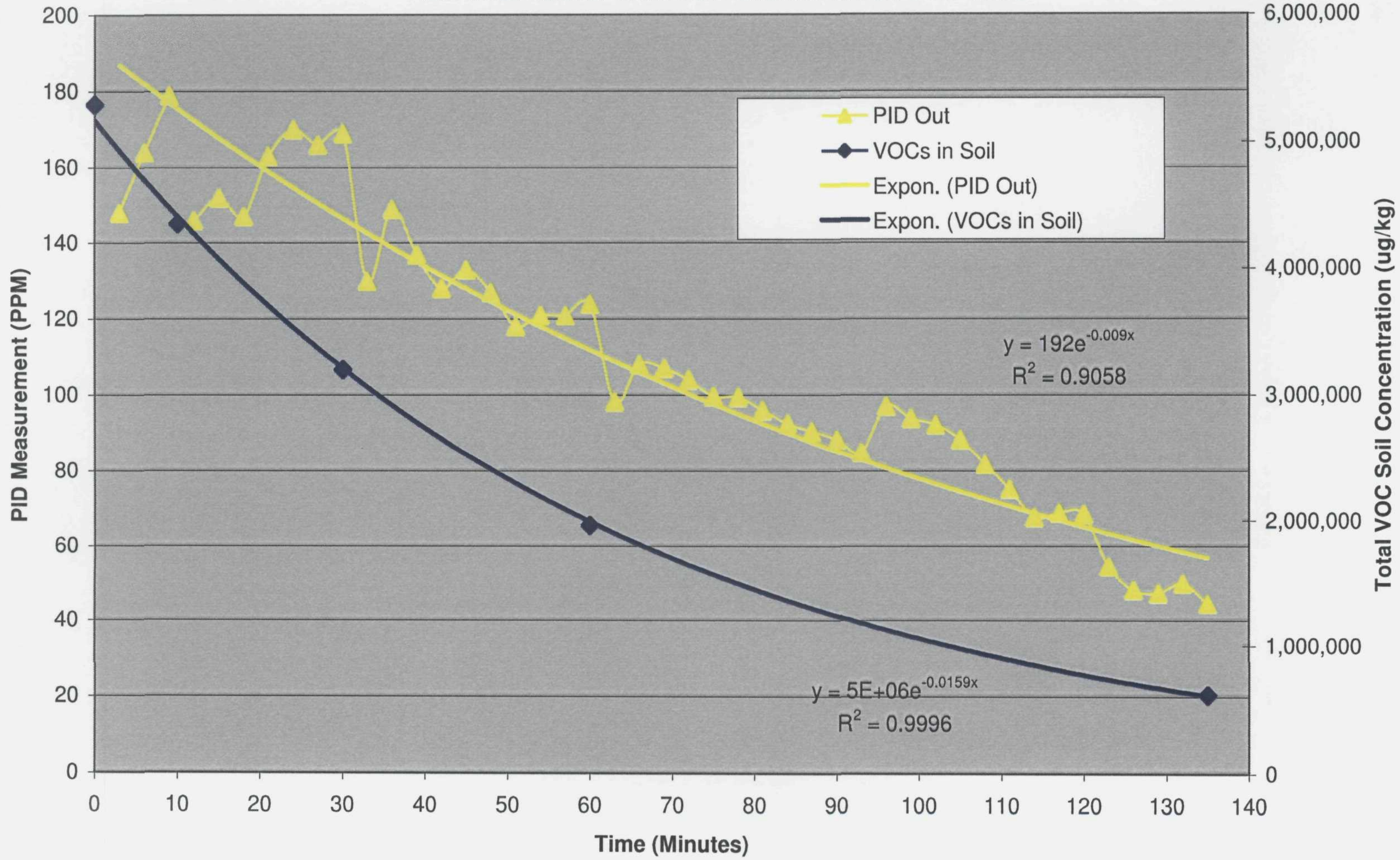


Figure 4
Nease Chemical Site - S/S/S Treatability Study
Phase III Air Stripping - Sample SE0190-015
Total VOC Results in Soil Over Time

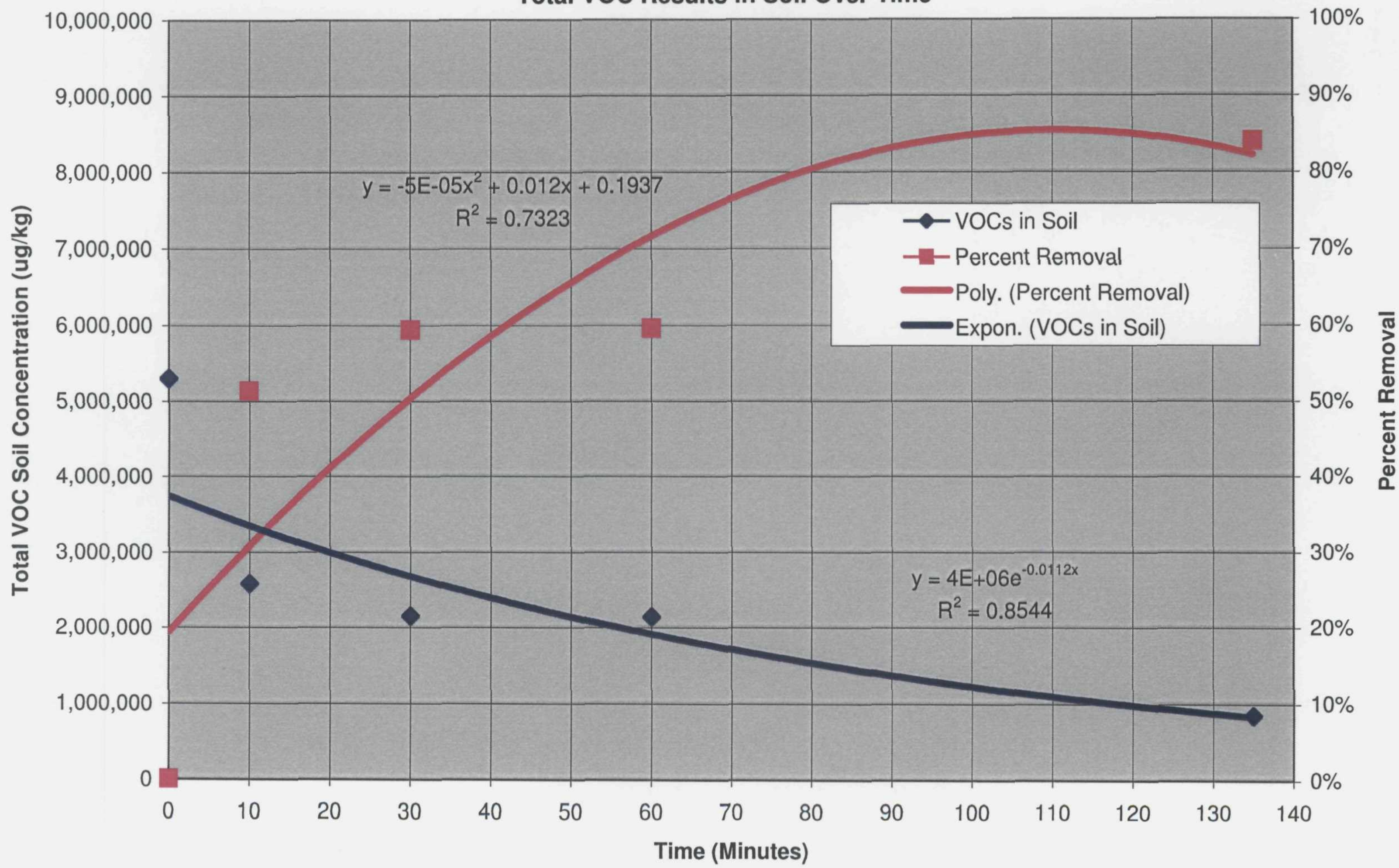


Figure 5
Nease Chemical Site - S/S/S Treatability Study
Phase III Air Stripping - Sample SE0190-016
Total VOC Results in Soil Over Time